

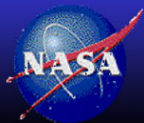
TISA (Time-Space Averaging) Update

D. Doelling
NASA LaRC

TISA Team:

R. Bhatt, B. Lock, D. Morstad, C. Nguyen,
M. Nordeen, R. Raju, M. Sun, H. Syed
SSAI

16th CERES-II Science Team Meeting
Livermore, CA, October 4-6, 2011

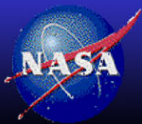


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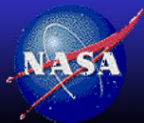
Outline

- CERES temporal interpolation methodology
- GERB validation of GEO fluxes
- GEO and BB satellite timeline
- GEO calibration update
- CERES prototype ordering tool improvements
- TISA products
 - ISCCP-D2like
 - TSI/SYN/AVG/ZAVG
 - Flux-by-cldtyp
- Summary

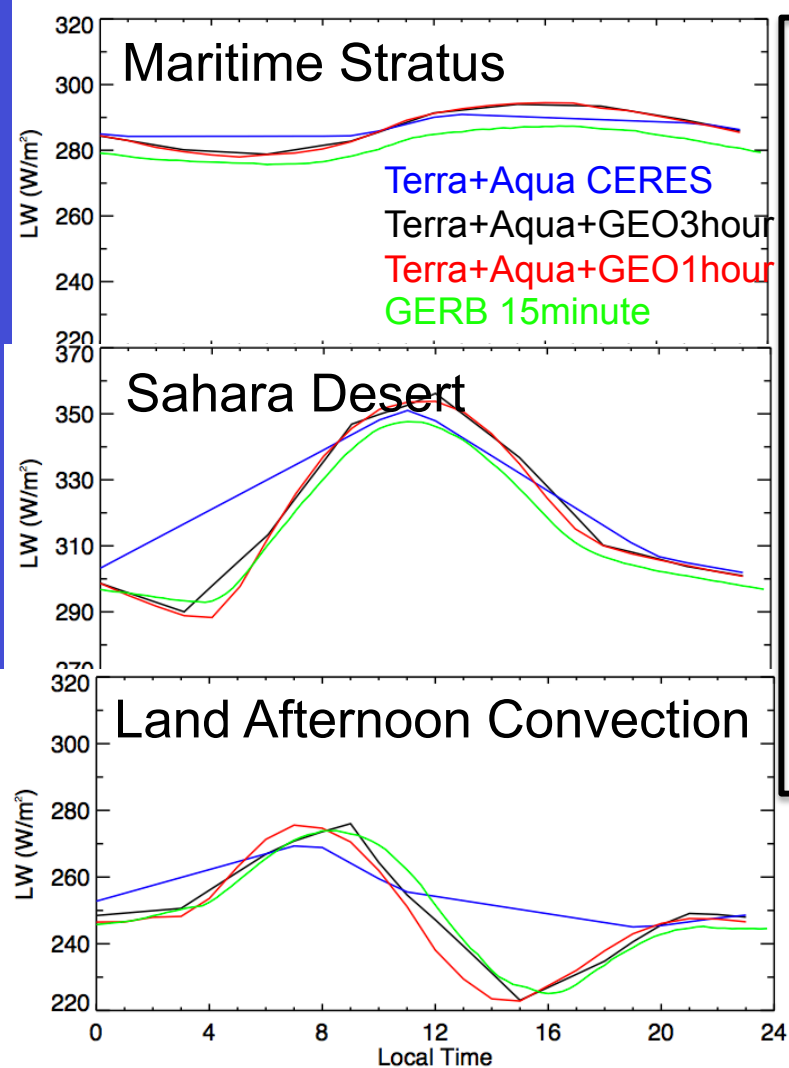


CERES temporal interpolation

- CERES-only or nonGEO temporal interpolation assumes constant meteorology between CERES observations to estimate the daily flux
- CERES/GEO temporal interpolation uses 3-hourly GEO derived BB fluxes in between CERES observations to estimate the daily flux
 - Calibrate GEO imager radiances against MODIS
 - Derive GEO 2 channel cloud properties
 - Convert imager radiances to MODIS equivalent radiances
 - Use MODIS to CERES NB to BB empirical models
 - Use CERES ADM to convert BB radiance to flux
 - Normalize the GEO fluxes with CERES to preserve CERES instrument calibration
- Validate both interpolation methods with 15 minute GERB BB fluxes onboard MET-8 during July 2004

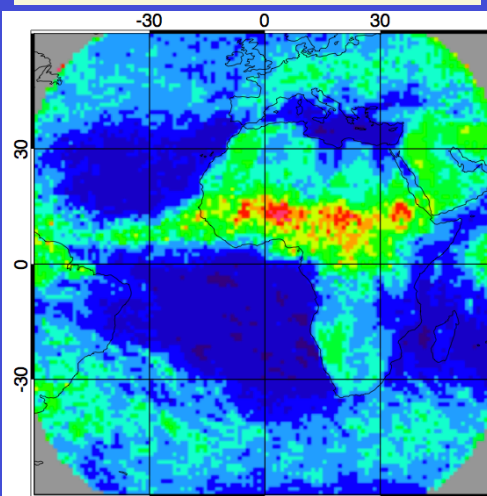


CERES/GEO LW temporal interpolation, July 2004

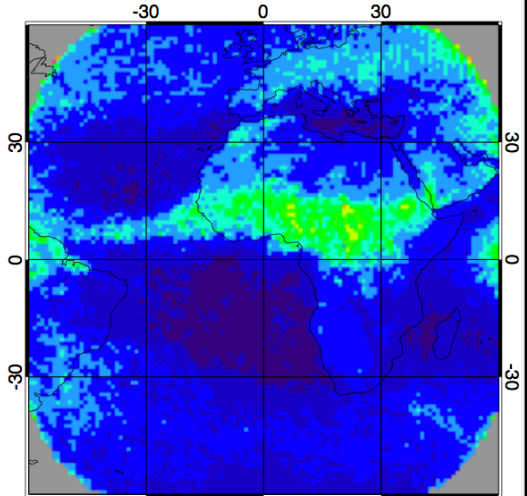


CERES – GERB LW hourly RMS error

Terra+Aqua CERES

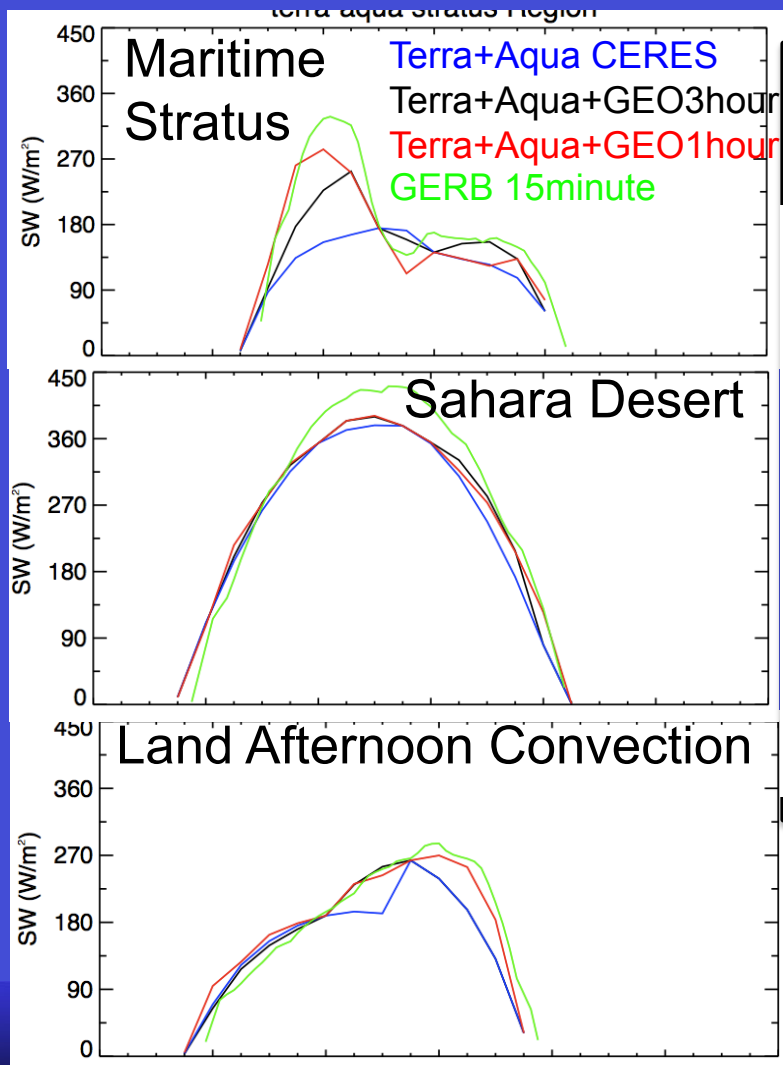


Terra+Aqua+GEO3hour



- 3-hourly GEO derived BB fluxes are normalized to the CERES observations to maintain the CERES instrument calibration
- 3-hourly GEO+CERES LW fluxes more closely resemble the GERB observed LW fluxes than relying on Terra and Aqua CERES only

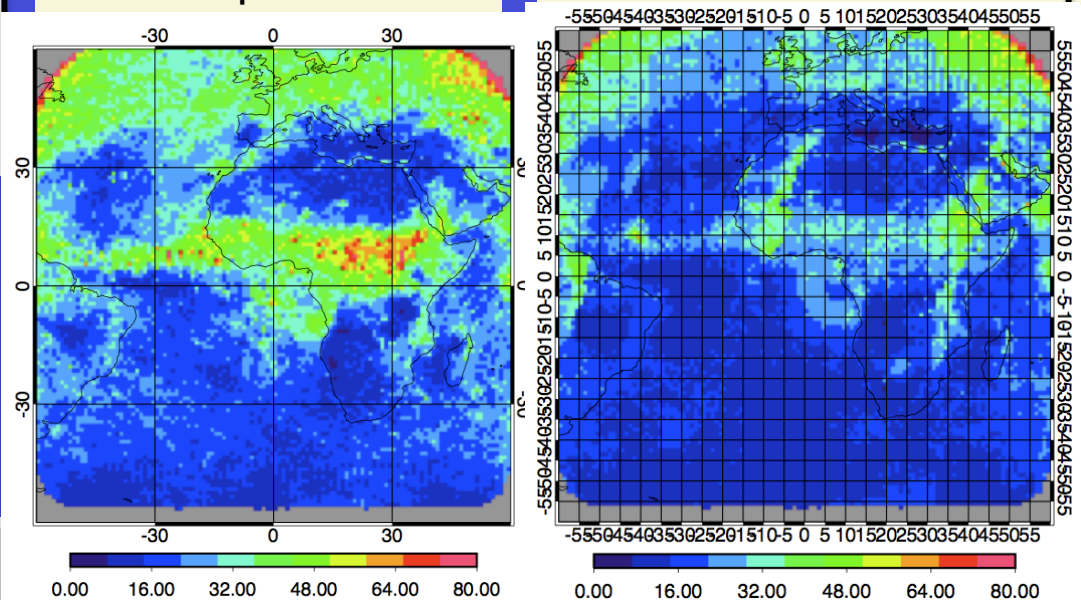
CERES/GEO SW temporal interpolation, July 2004



CERES – GERB SW hourly RMS error

Terra+Aqua CERES

Terra+Aqua+GEO3hour



- 3-hourly GEO derived BB fluxes are normalized to the CERES observations to maintain the CERES instrument calibration
- 3-hourly GEO+CERES SW fluxes more closely resemble the GERB observed LW fluxes than relying on Terra and Aqua CERES only

Comparison of GERB and CERES/GEO fluxes

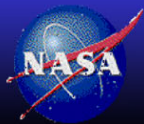
Hourly RMS for July 2004

Dataset	SW (%)	LW-day (%)	LW-nit (%)
Terra	24.1	5.0	4.7
Aqua	24.0	4.6	4.8
Terra+Aqua	18.3	3.5	3.4
Terra+GEO3hr	14.9	3.5	3.3
Aqua+GEO3hr	15.4	3.2	3.1
Terra+Aqua+GEO3hr	14.0	2.9	2.7
Terra+GEO1hr	13.8	3.3	3.2
Aqua+GEO1hr	14.1	3.1	3.0
Terra+Aqua+GEO1hr			
Terra-Aqua nonGEO	28.0	5.5	5.4
Terra-Aqua GEO3hr	10.3	3.4	3.4
Terra-Aqua GEO1hr	7.3	3.1	3.1

- GEO 1-hourly improves both diurnal sampling and NB to BB over 3-hour
- GEO 3-hourly sufficient for monthly, whereas 1-hourly needed for daily

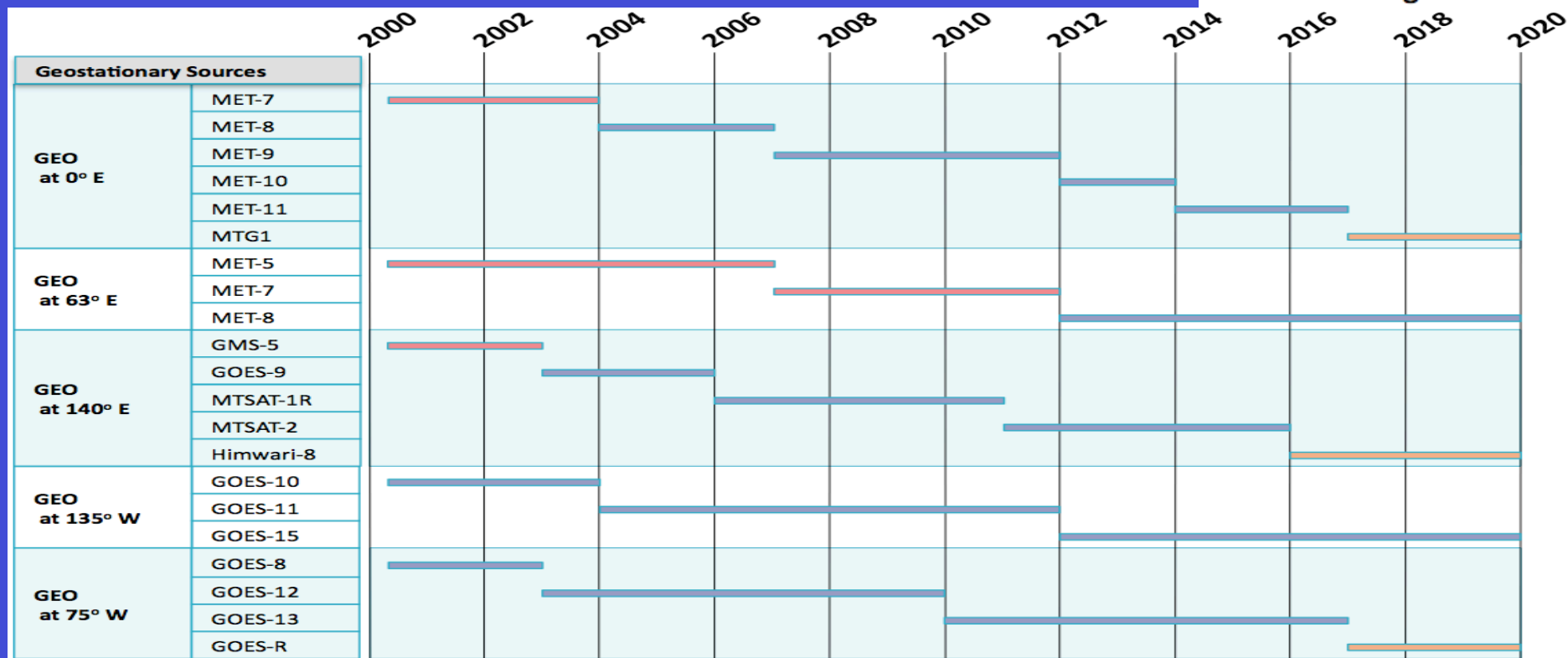
GEO and BB satellites

- GEO satellite 2000-2020 timelines
 - GEO cloud retrieval quality is dependent on which GEO satellite generation is used
- Broadband Missions
 - ScaRaB (Megha-tropiques) to launch Oct 12, 2011
 - CERES FM-5 (NPP) to launch in Oct 25, 2011
 - GERB-3 (Met-10) to launch in Jan 2012
 - GERB-2 (Met-8 to move to Indian Ocean)
 - These missions will be used as temporal averaging validation datasets



GEO Satellite Chart

— 1st generation
— 2nd generation
— 3rd generation

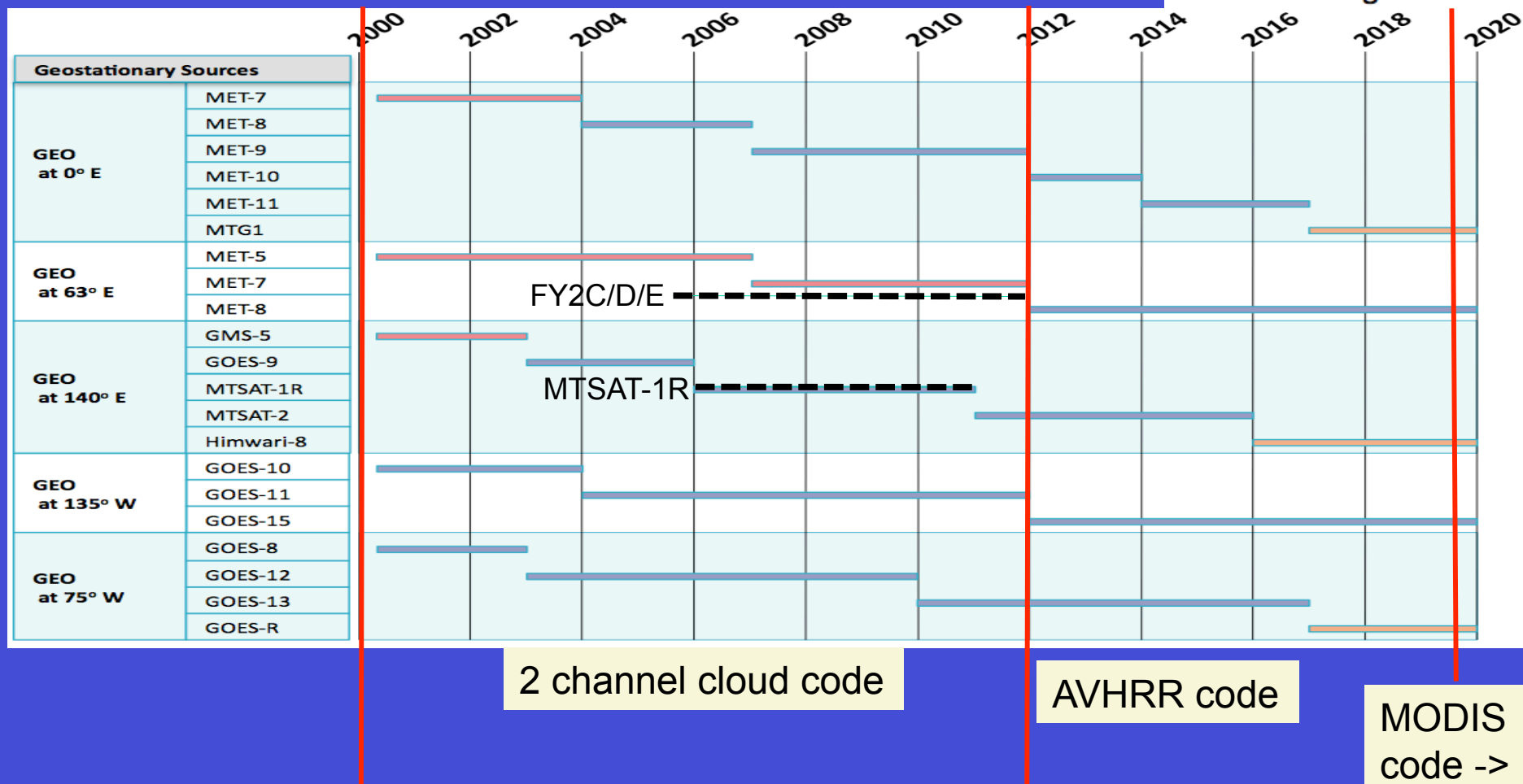


GEO satellites	1st	2nd	3rd
Channels	3 (VIS,WN,WV)	5 (AVHRR) 9=Met8/9 (15min FD)	16 (MODIS) 15 min FD
IR resolution	4km	4km	2km
VIS resolution	1km	1km	0.65µm @0.5km
VIS calibration	no	no	Solar Diffuser



GEO Satellite Chart

— 1st generation
— 2nd generation
— 3rd generation



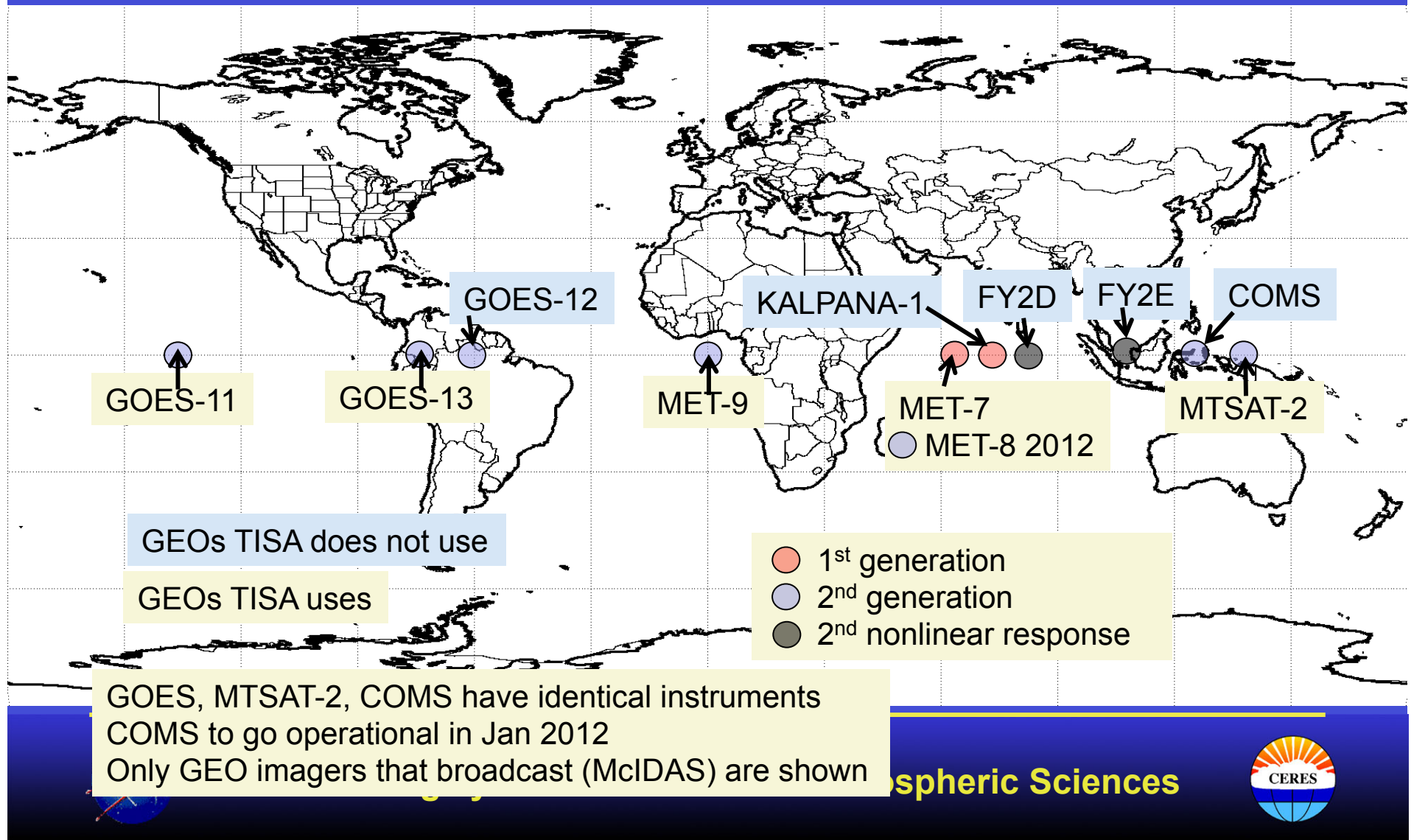
---- 2nd generation satellites with nonlinear response



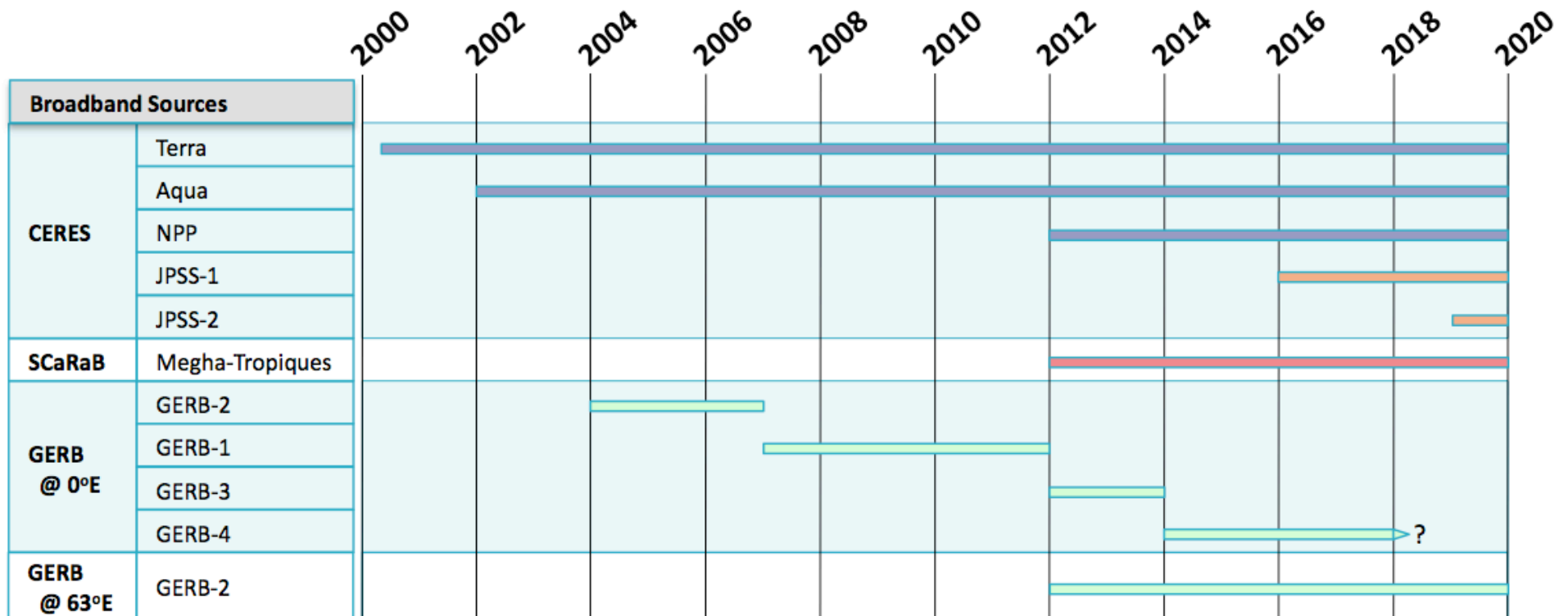
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GEO Satellite Position, October 2011



Broadband Satellite Chart



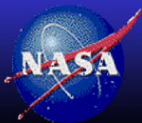
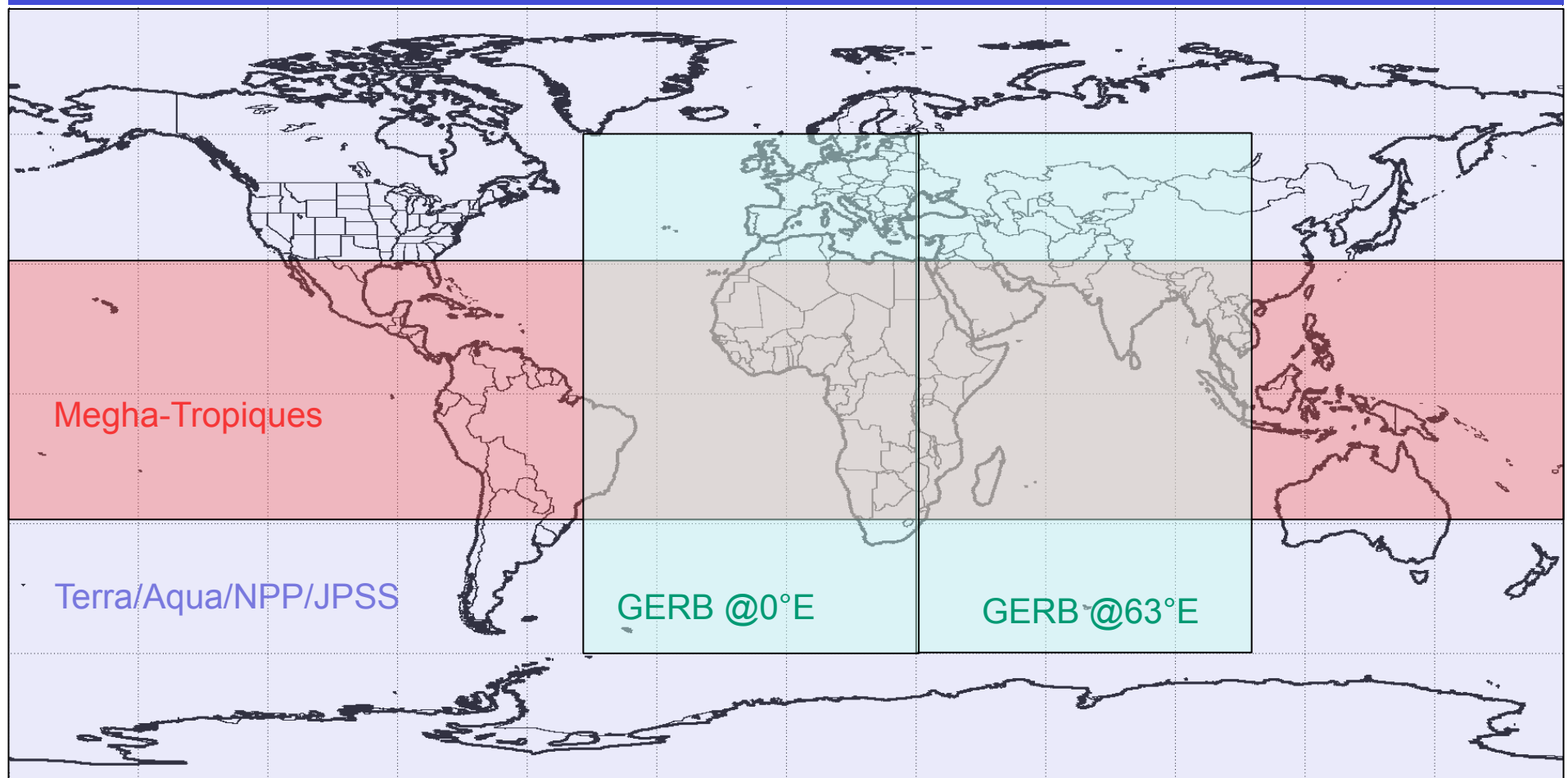
	CERES	CERES-2	SCaRaB	GERB
Orbit	Terra 10:30AM Aqua 1:30PM	SS 1:30PM	7 day repeat 20° inclination	GEO 15 minutes
Footprint size	~20km	-25km	40km	45x40km
Channels	SW,TOT	SW,TOT,LW	SW,TOT, VIS, WN	SW, TOT

* Does not include Earthcare or FY3A/B/C/E ERM

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Broadband Satellite Coverage



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GEO calibration update

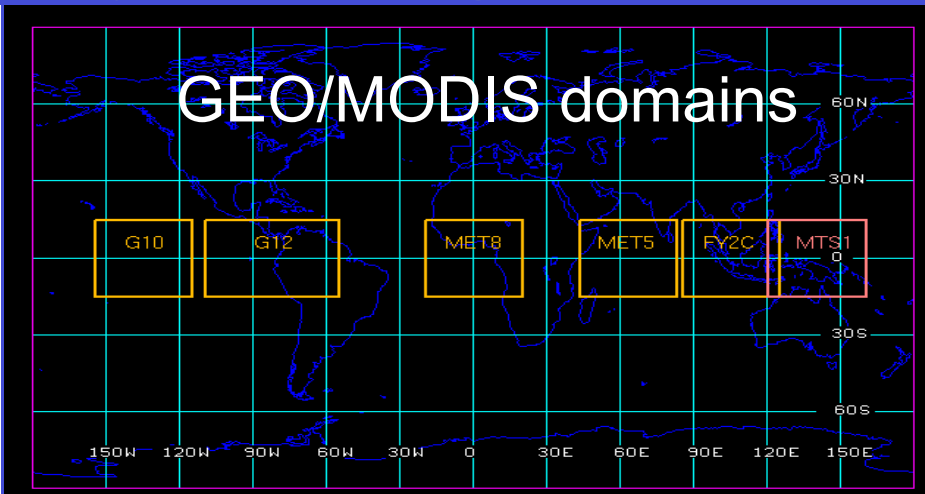
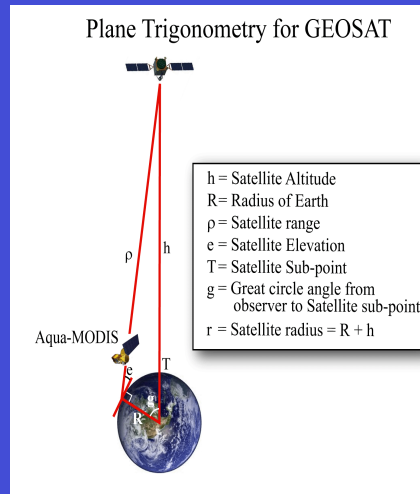
- Recalibrate all GEOs to Aqua-MODIS between 2000-2011 over their respective life times using multiple independent calibration approaches
 - Aqua-MODIS more stable over time than Terra-MODIS
 - Transfer Aqua-MODIS calibration using ray-matching, deep convective clouds, and desert targets
 - Use SCIAMACHY pseudo radiance regressions over each target domain to account for spectral response function differences
 - Use SCIAMACHY/GEO ray-matching over GEO lifetime as validation
- Compare MTSAT-2 and MTSAT-1 coincident visible radiances to examine MTSAT-1 nonlinear VIS response

D. Doelling, P. Minnis, *NASA LaRC*

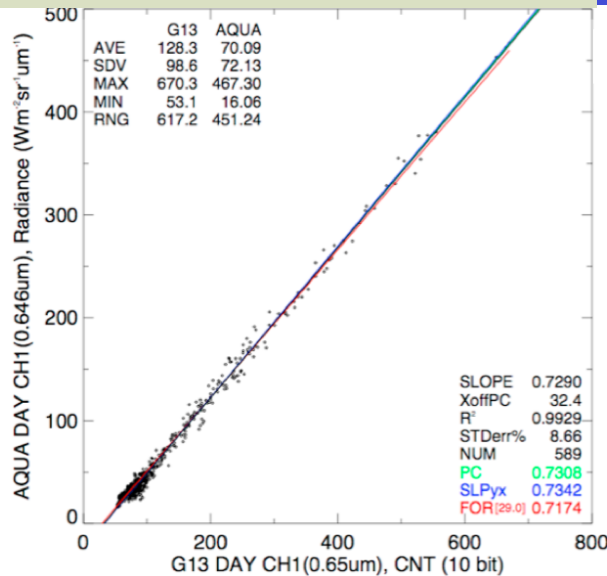
R. Bhatt, D. Morstad, B. Scarino, A. Gopalan, *SSA/*

Jack Xiong, Aisheng Wu, NASA GISS

Ray-matching

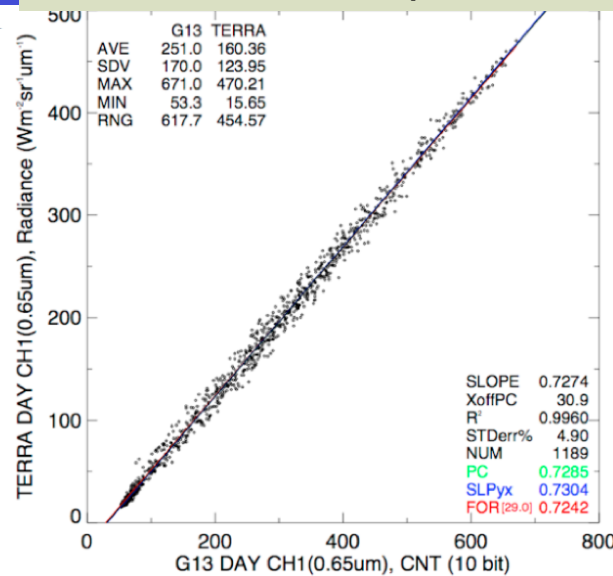


GOES-13/Aqua April 2010



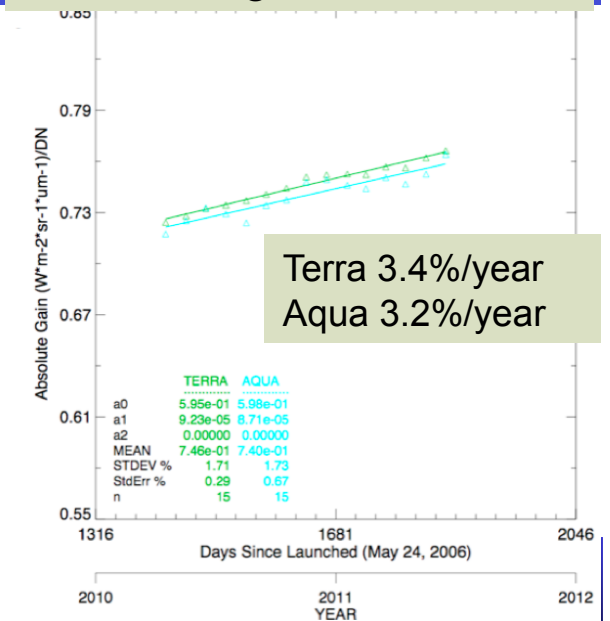
Tie GEO calibration to Aqua-MODIS as absolute reference

GOES-13/Terra April 2010



Plot 50km² ray-matched radiances
 Terra adjusted to Aqua using SNO

GOES-13 gain 2010-2011

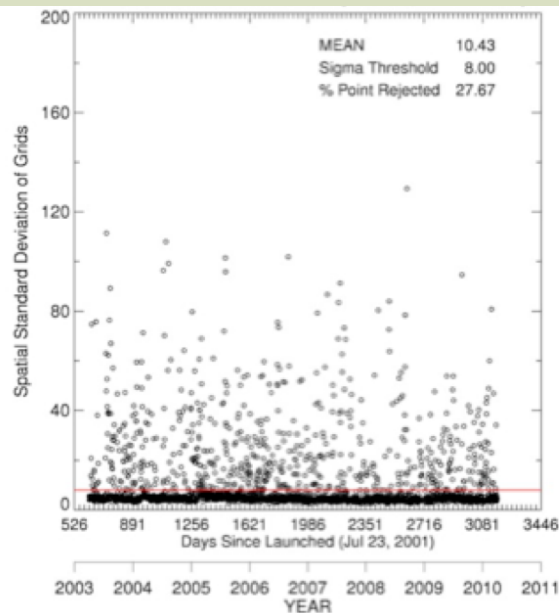


Track monthly gains over time

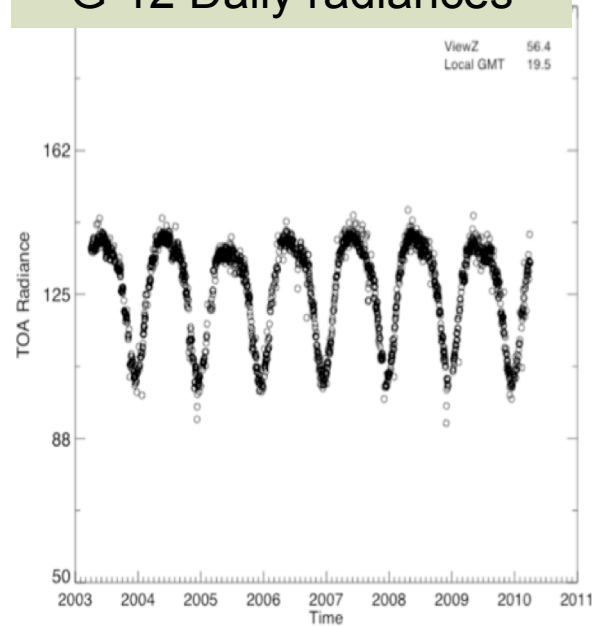
Derive GEO Desert Reference Model

- Use daily spatial standard deviations to determine clear-sky conditions over Desert, For GOES-12 use Sonoran Desert
- Use Aqua/GEO Ray-matching to calibrate GOES-12 daily noon radiances
- Average multi-year daily noon seasonal cycle radiances to derive TOA desert reference model
- The viewing and solar geometry is identical, when GEOs are replaced. Calibrate GEOs with same sub-satellite with reference radiance

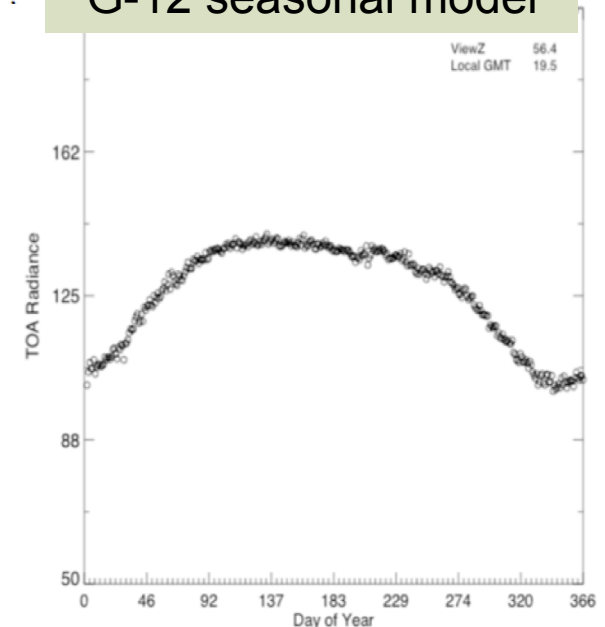
G-12 Daily spatial sigmas



G-12 Daily radiances

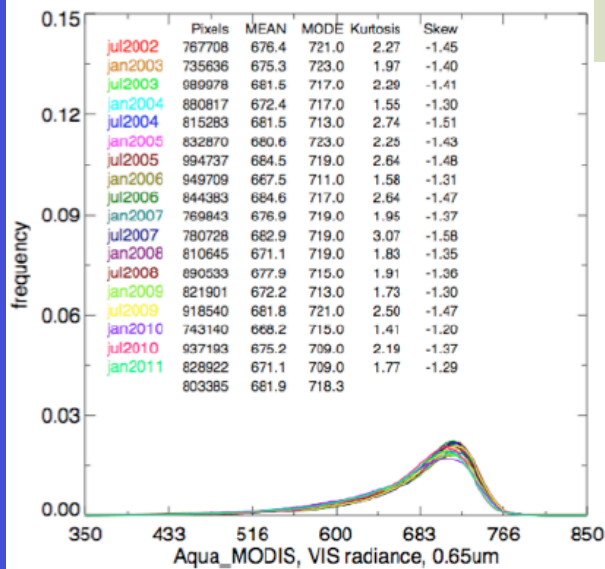


G-12 seasonal model

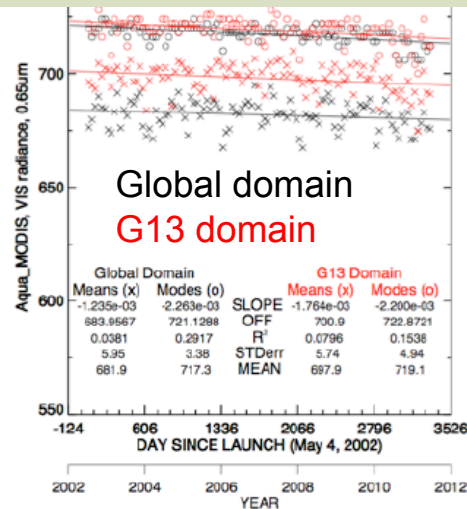


DCC calibration

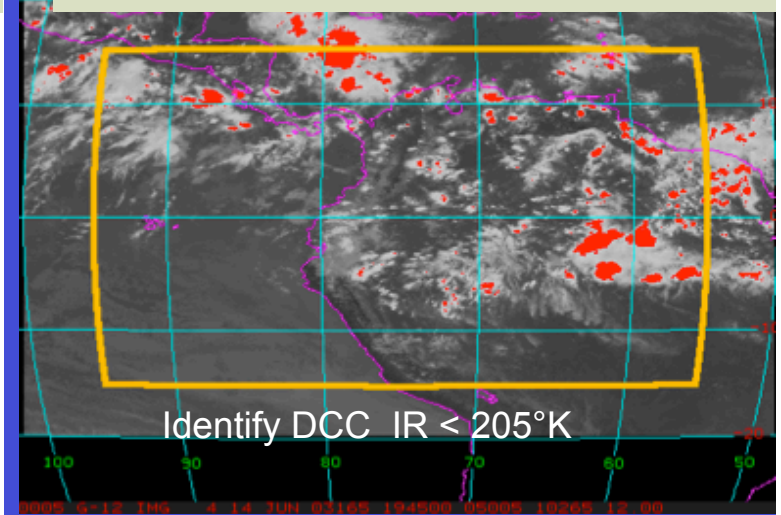
Aqua DCC PDFs over G-13



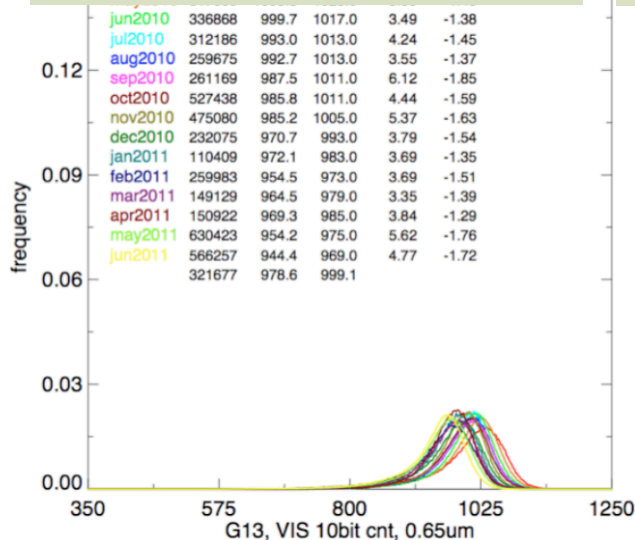
Use PDF Mode to transfer Aqua calibration



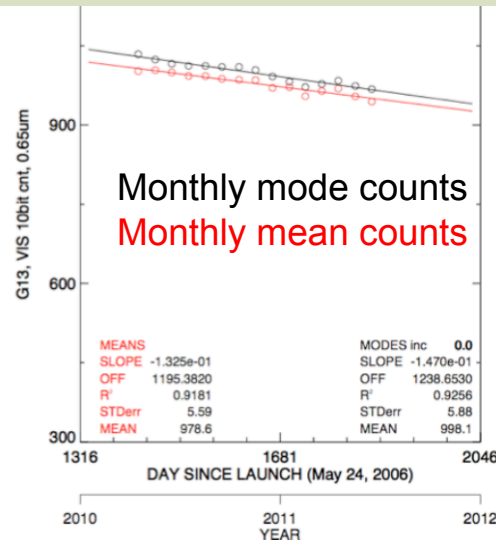
GOES-12 Jun 14 2003 19:45 GMT



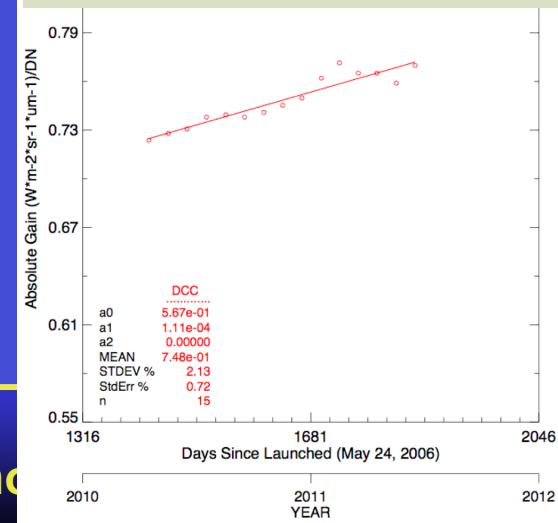
GOES-13 DCC radiance PDFs Taken at 1:30PM



GOES-13 DCC radiance trends

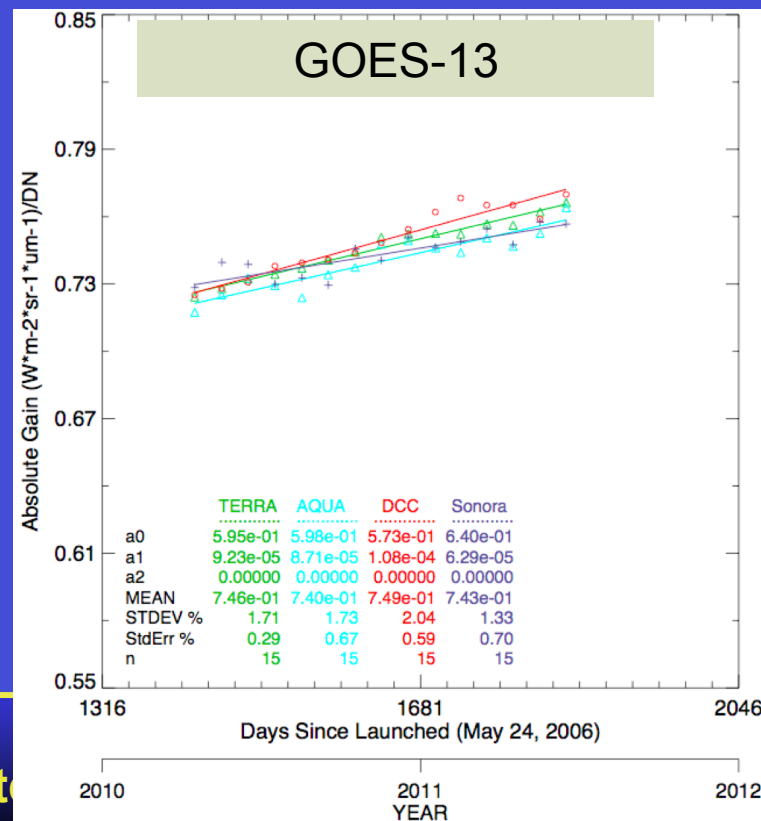
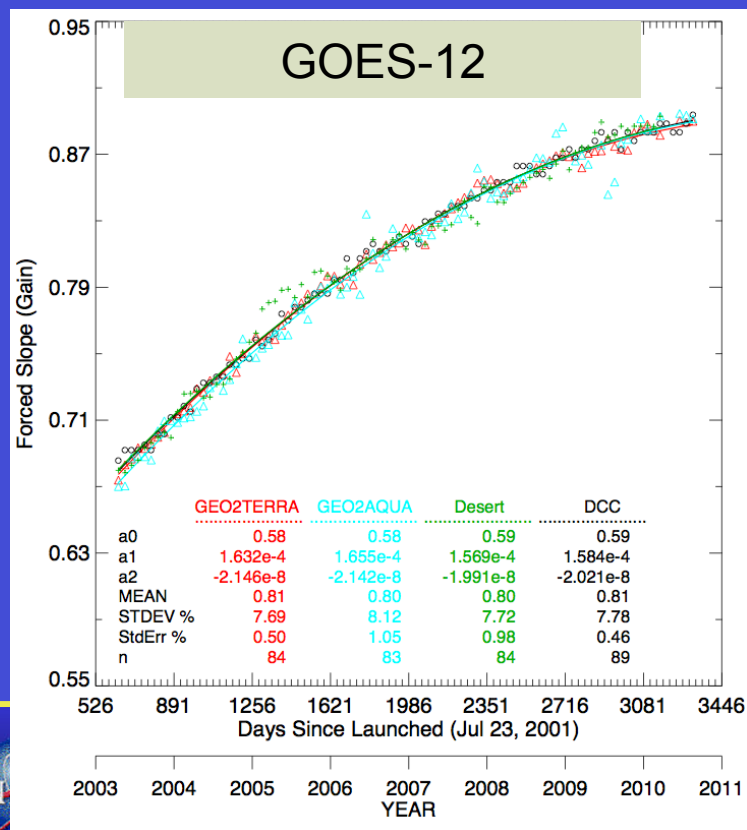


GOES-13 Mode monthly Gains 2010-2011



Validation/Conclusion

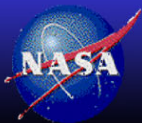
- Both GOES-12 and GOES-13 independent multi-method absolute calibration consistency is within 1.3% with temporal regression standard errors <1%



Terra/Aqua MODIS stability conclusions

%/decade	Terra	Aqua	Terra/Aqua
DCC	-2.5	0.2	-2.7
Libyan Desert	-2.1	0.0	-2.1
Dome C	-1.6	0.5	-2.1
NOAA-16			-2.1
GOES-12			-3.0

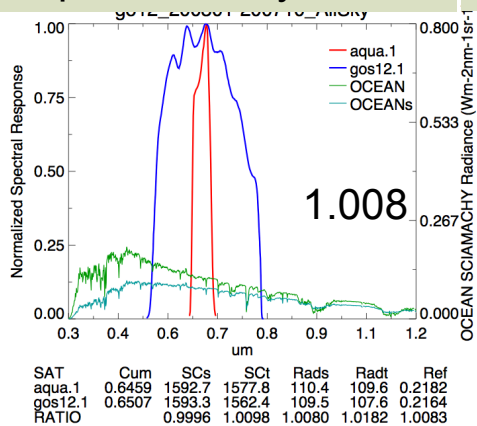
- All validation methods are consistent within 1%
- Aqua-MODIS Collection 5 L1B Band 1 is stable within 0.5%
- Terra-MODIS has degraded by ~2%
- Use Aqua-MODIS as CERES absolute calibration reference
 - Better characterized sensor provides better on orbit performance



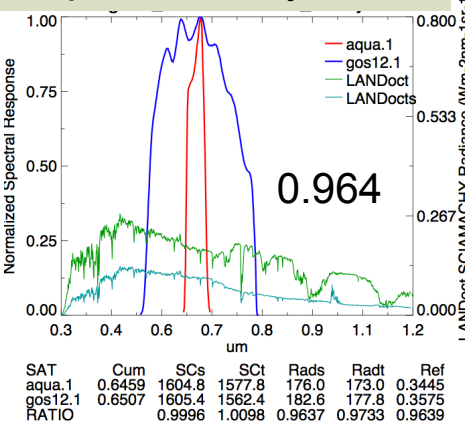
Hyper-spectral SCIAMACHY based spectral corrections

Aqua-MODIS/GOES-12 pseudo mean SCIA radiance spectra, and reflectance ratio

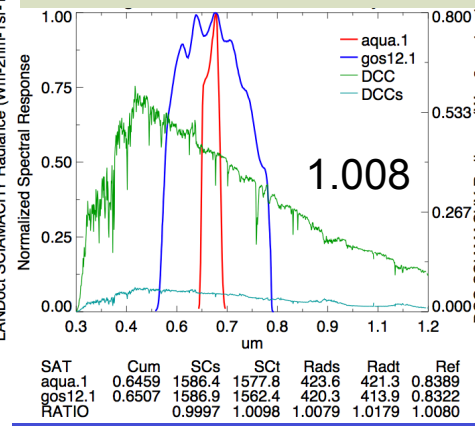
Equator All-sky Ocean



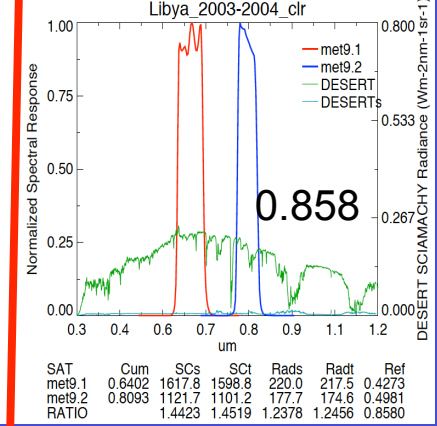
Equator All-sky Land



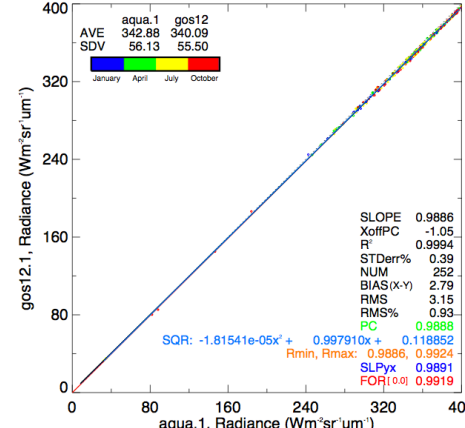
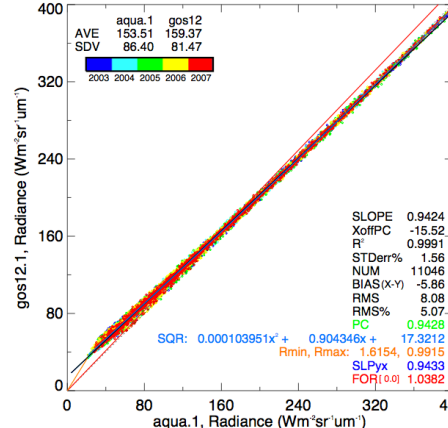
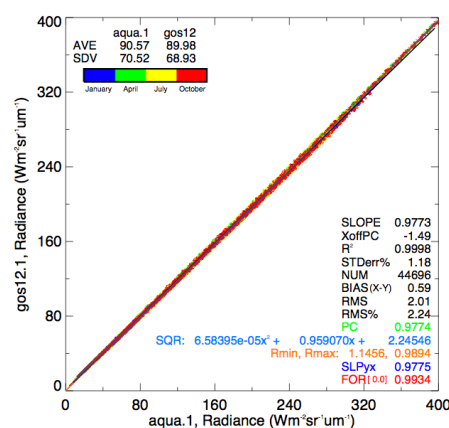
DCC



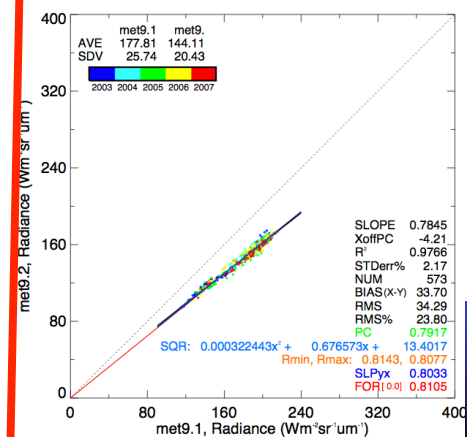
Libyan Desert



SCIA footprint pseudo radiance of Aqua vs GOES-12

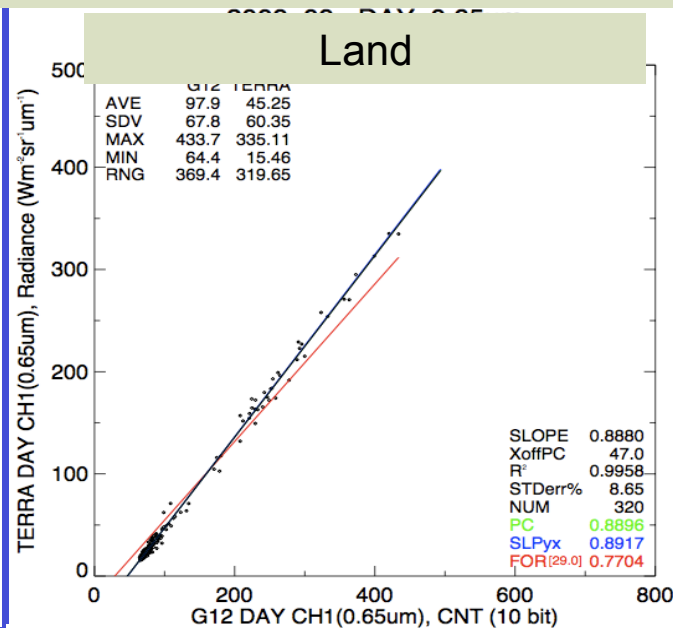
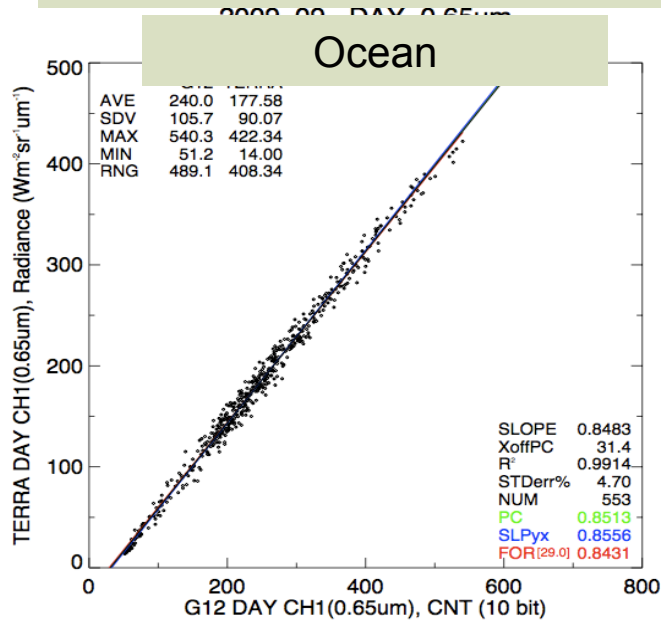


MET9 0.65/0.86μm



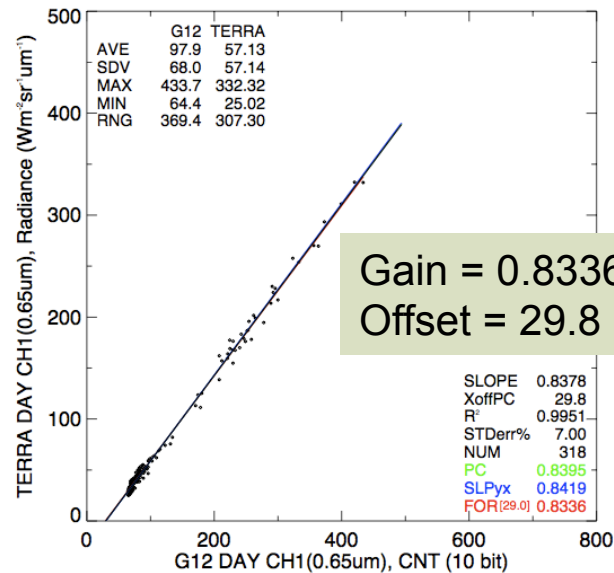
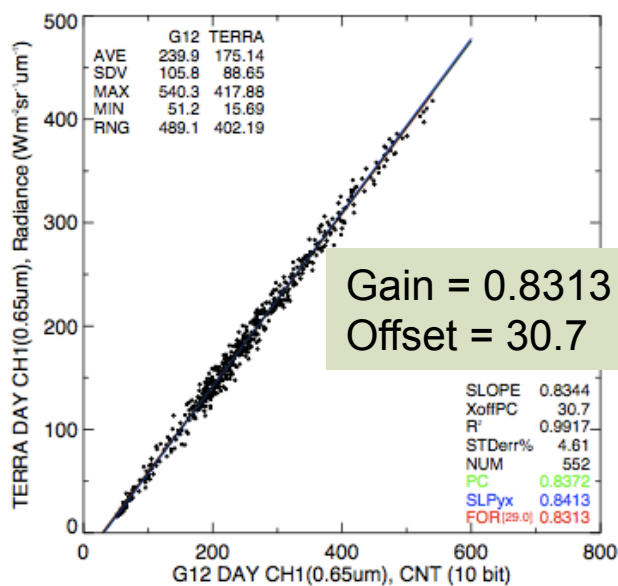
GOES-12/Terra-MODIS September 2009

SCIAMACHY SBAF Validation



- Ocean/Land gain difference = 5.3%, offset=31, 47
- After SBAF the gain difference = 0.3%, offset=31, 30

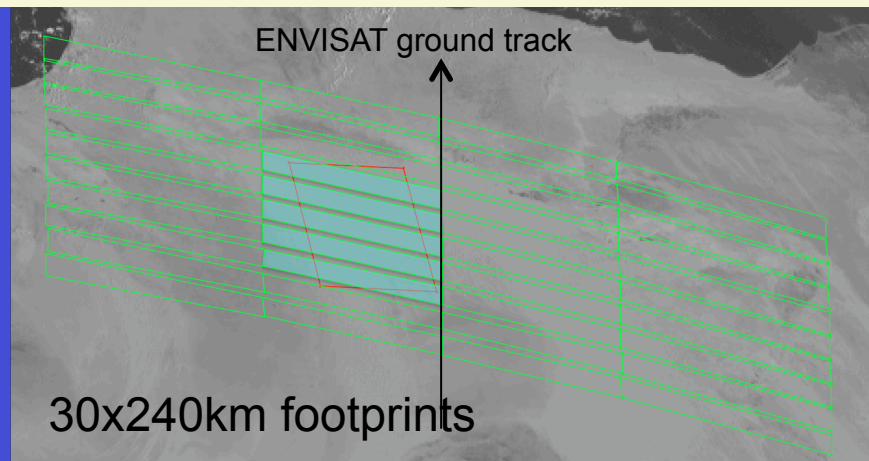
After SCIAMACHY spectral band adjustment factor (SBAF)



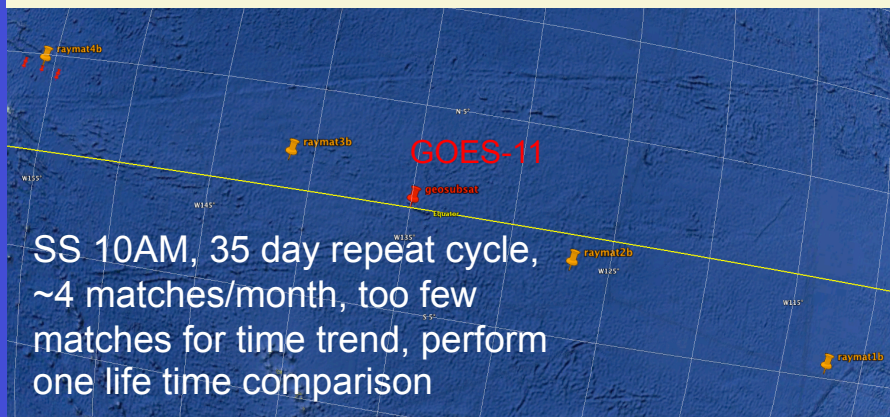
Earth Sciences



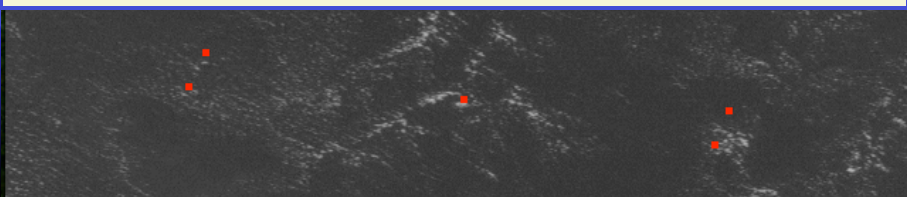
ENVISAT and Aqua ground-track intersect June 1, 2006 ~19 GMT



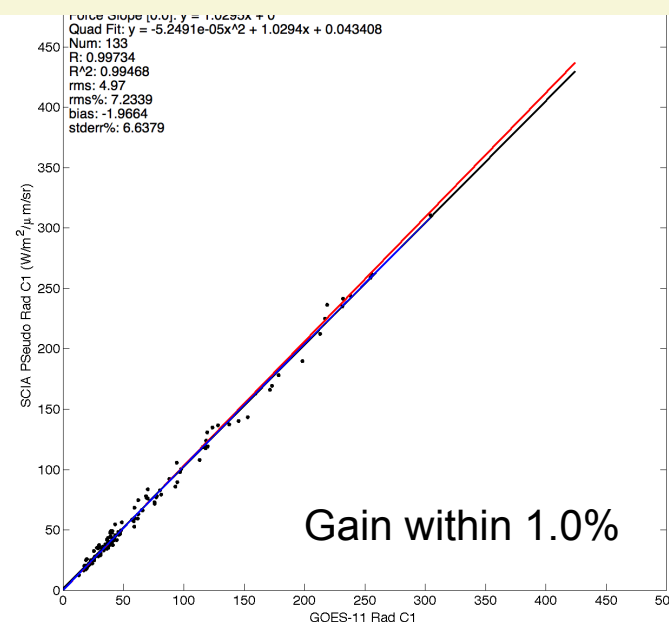
The 4 SCIA/GEO ray-matched positions



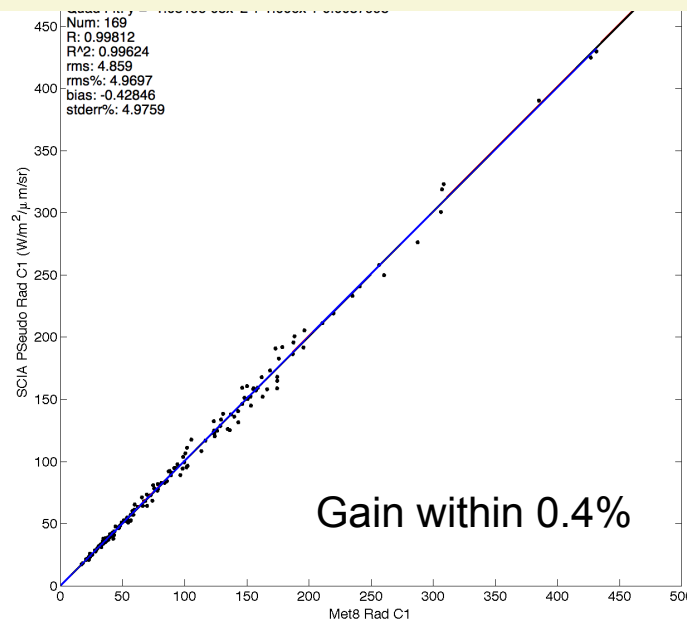
GOES-11 Sept 2, 2006 19 GMT VIS image overlaid with SCIA footprint



GOES-11/SCIA 2006-2010



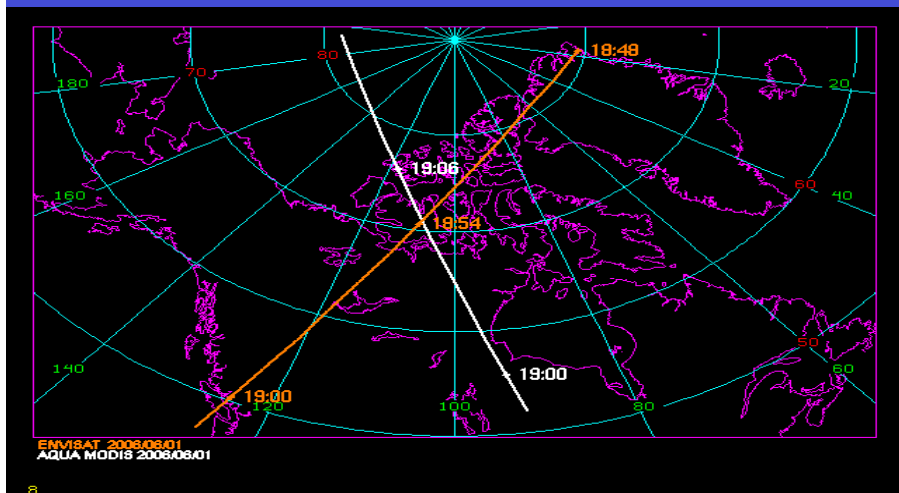
MET-9/SCIA 2007-2010



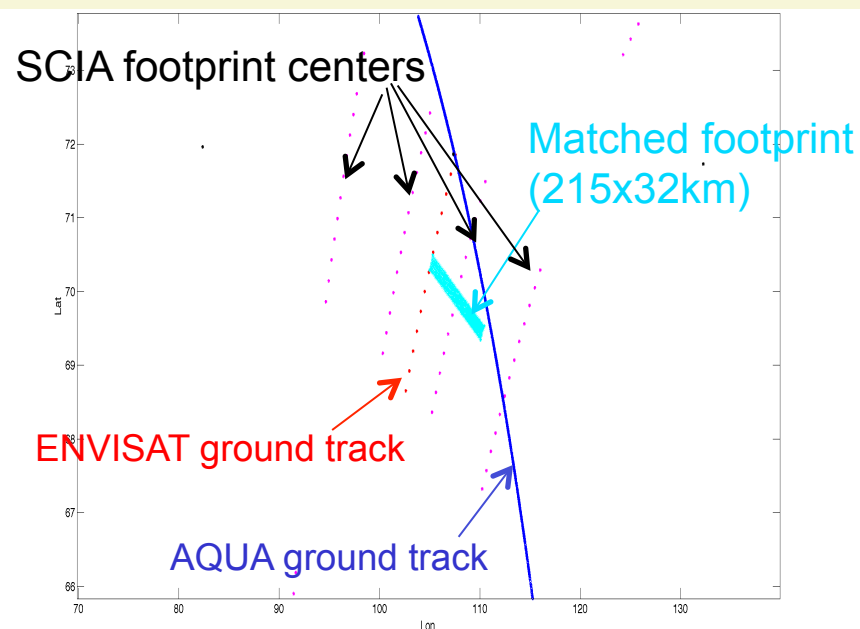
SCIAMACHY/GEO ray-matching



ENVISAT and Aqua ground-track intersect
June 1, 2006 ~19 GMT

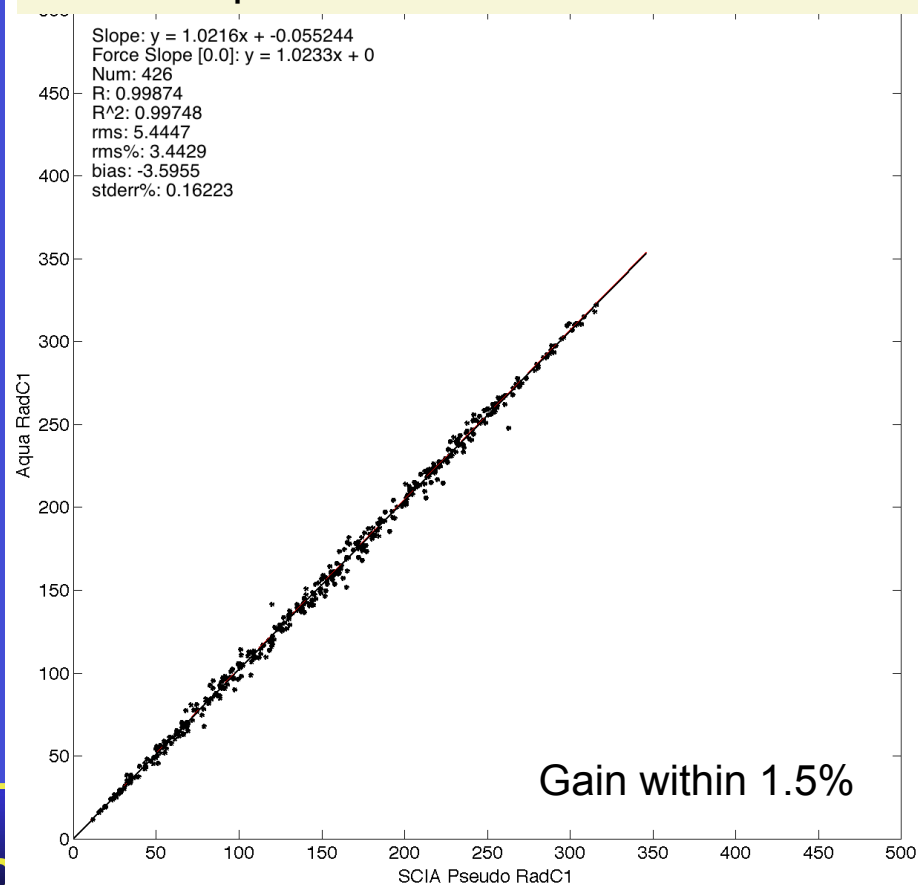


June 23, 2004



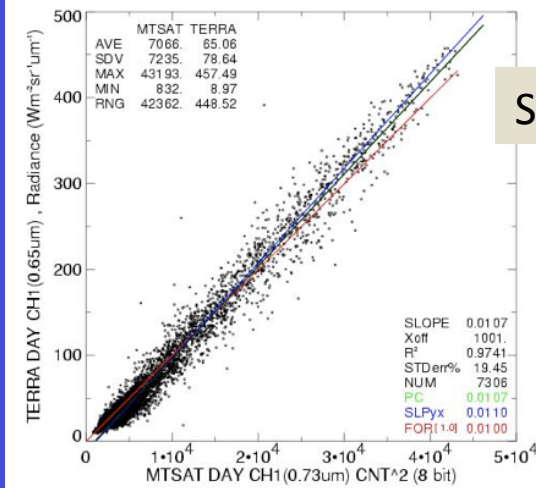
SCIAMACHY/Aqua-MODIS ray-matching

Aqua-MODIS/SCIA ray-matched
footprint radiances 2003-2008

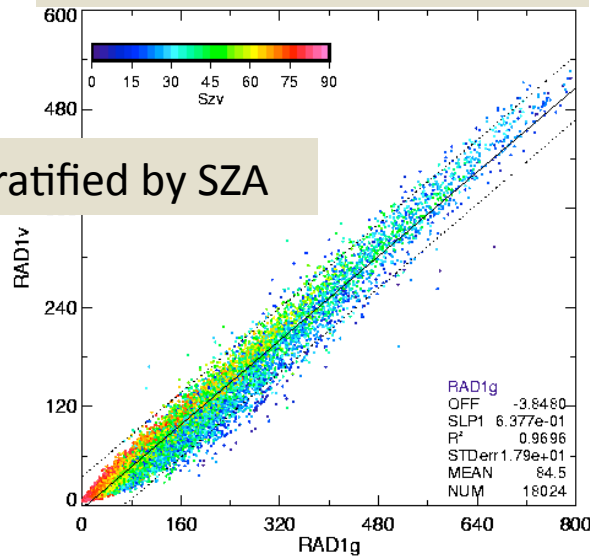


MTSAT-1 nonlinear calibration

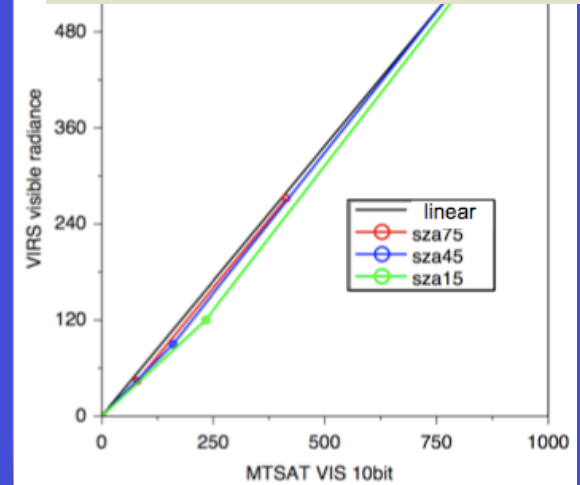
MTSAT-1/Terra April 2006



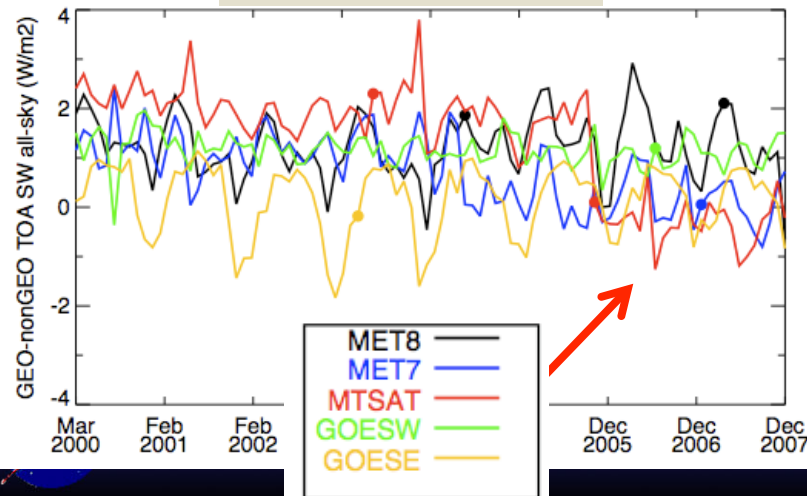
MTSAT-1/VIRS



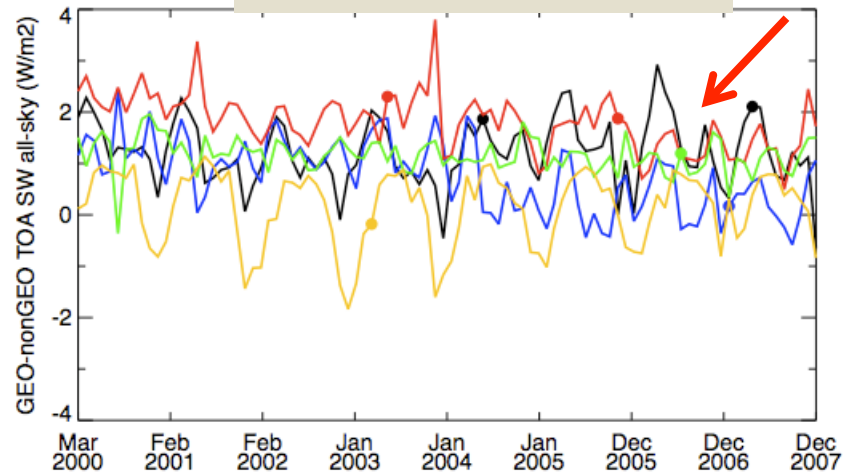
MTSAT-1 nonlinear gain



Linear calibration



Non-Linear calibration

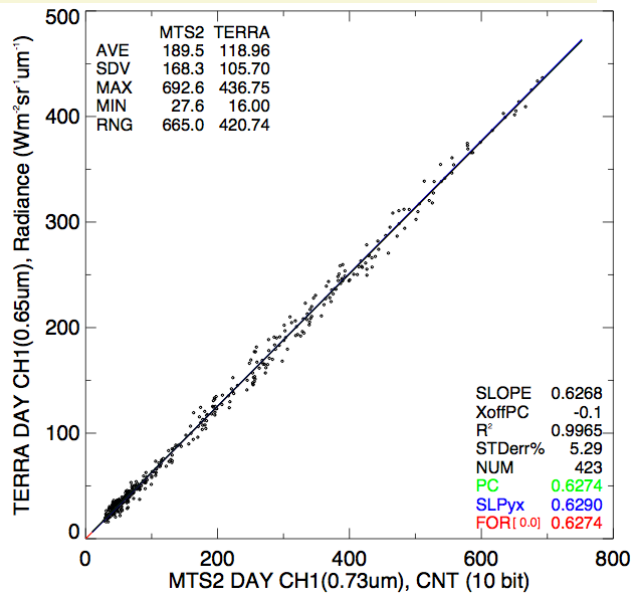


GEO-nonGEO SW trends

MTSAT-1R vs MTSAT-2 comparisons

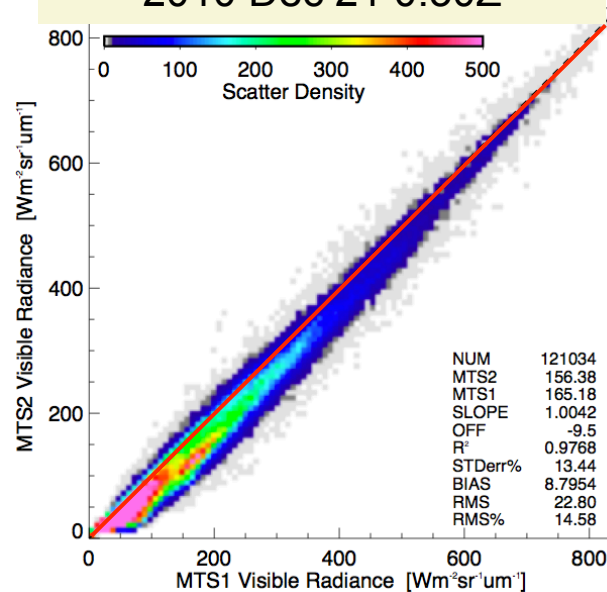
- MTSAT-2 launched in Feb 18, 2006, on standby until 2011
- Have been requesting **coincident MTSAT1/2** data since 2008 and to make **MTSAT-2 operational**
- MTSAT-2 operational from Dec 23, 2010
- Have received from JMA 3 days of overlap data from Dec 21-23, 2010
- And now the ugly truth about MTSAT-1

MTSAT-2/Terra Jan 2011



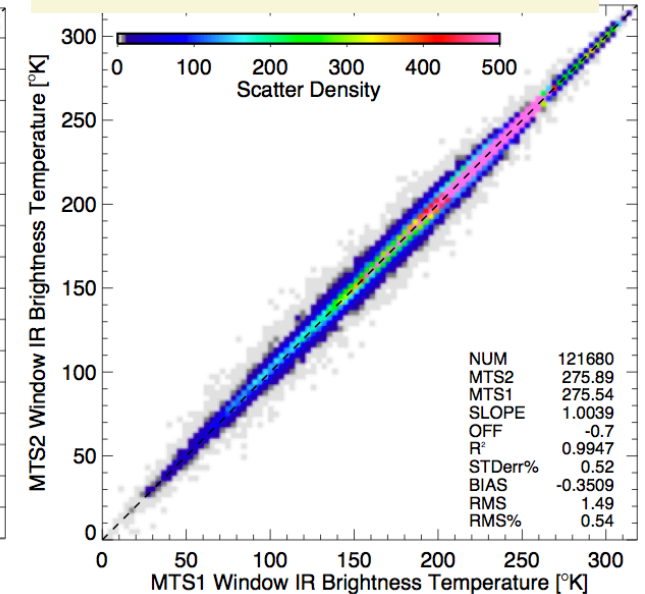
MTSAT-2 is a linear instrument

VIS MTSAT-1/MTSAT-2
2010 Dec 21 0:30Z

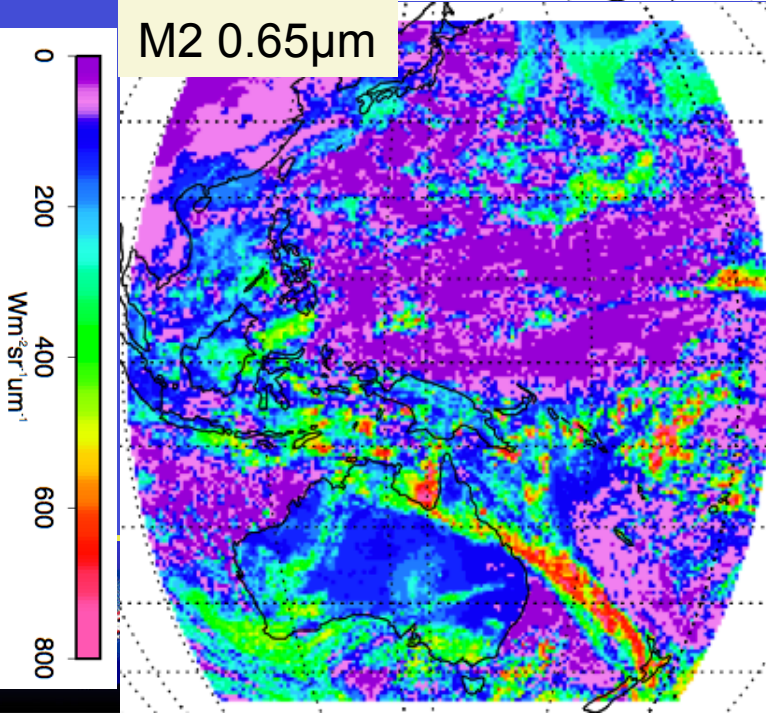
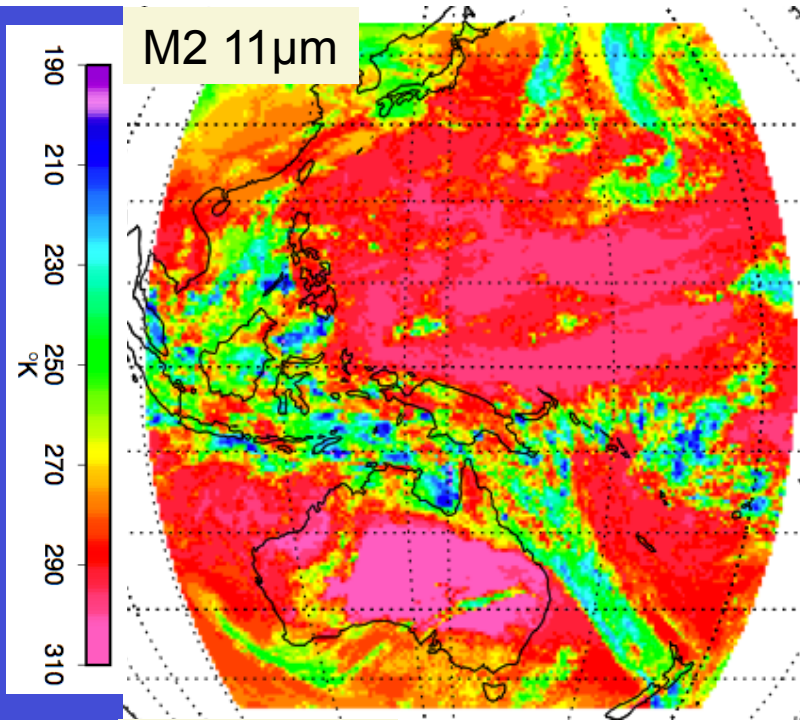


MTSAT-1 overestimates MTSAT-2

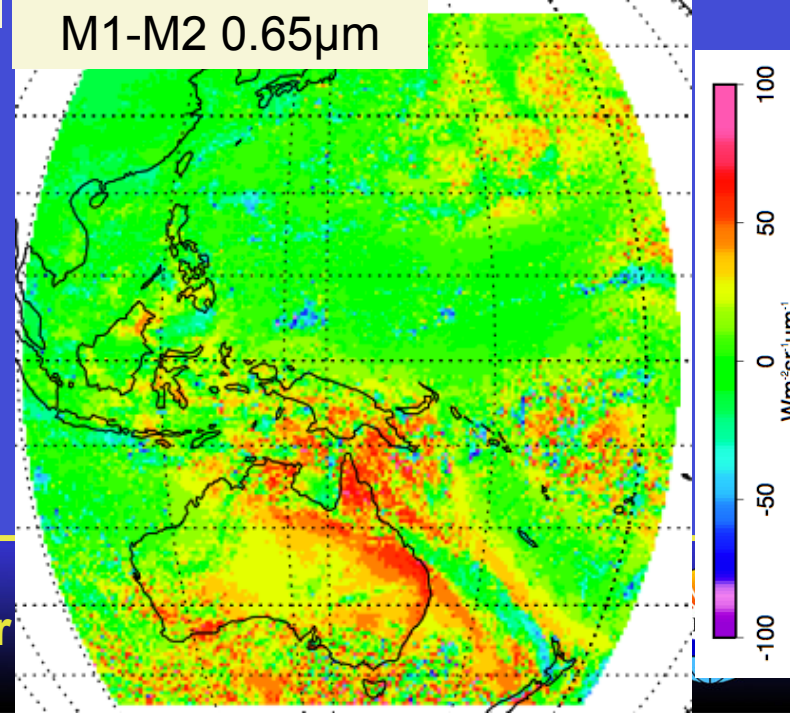
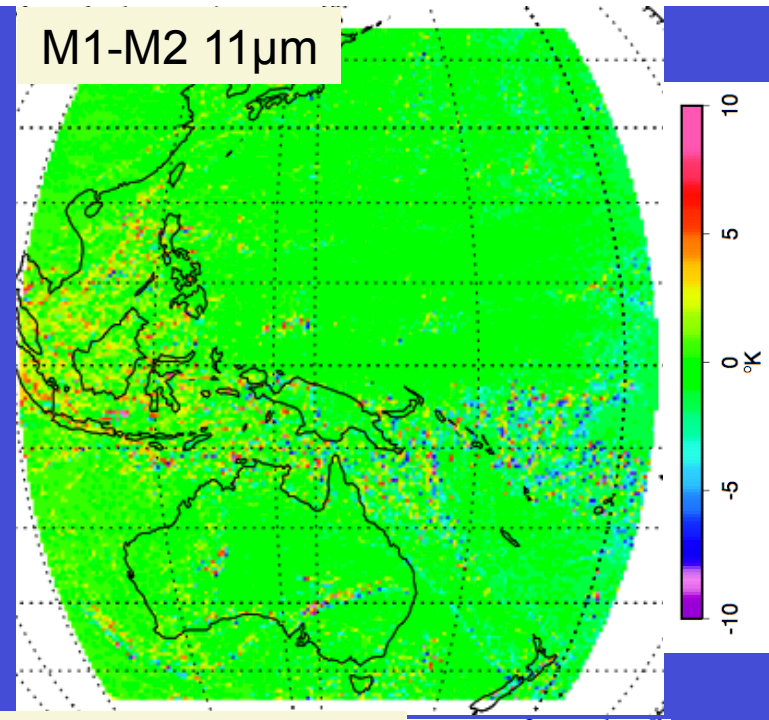
IR MTSAT-1/MTSAT-2
2010 Dec 21 0:30Z



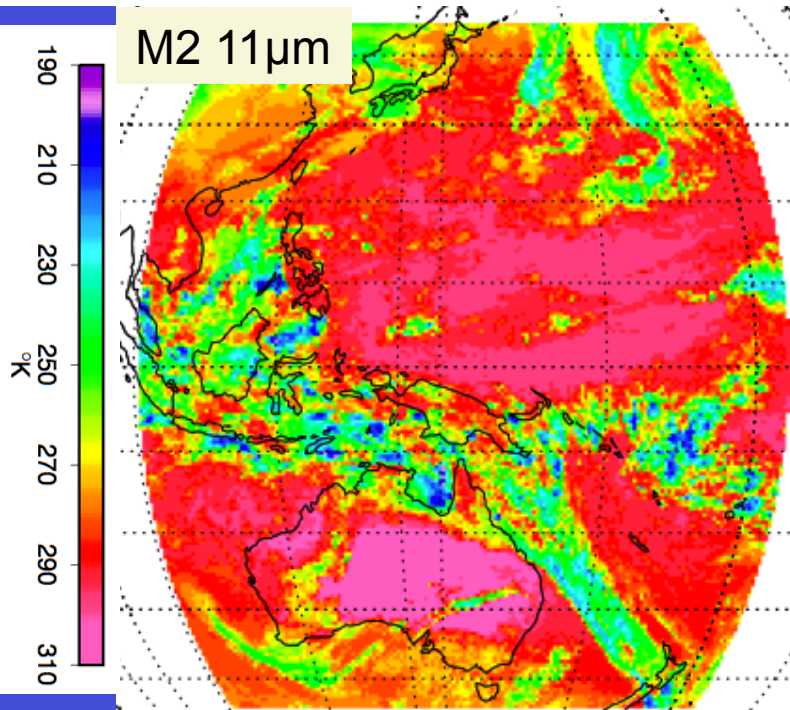
IR demonstrates good navigation



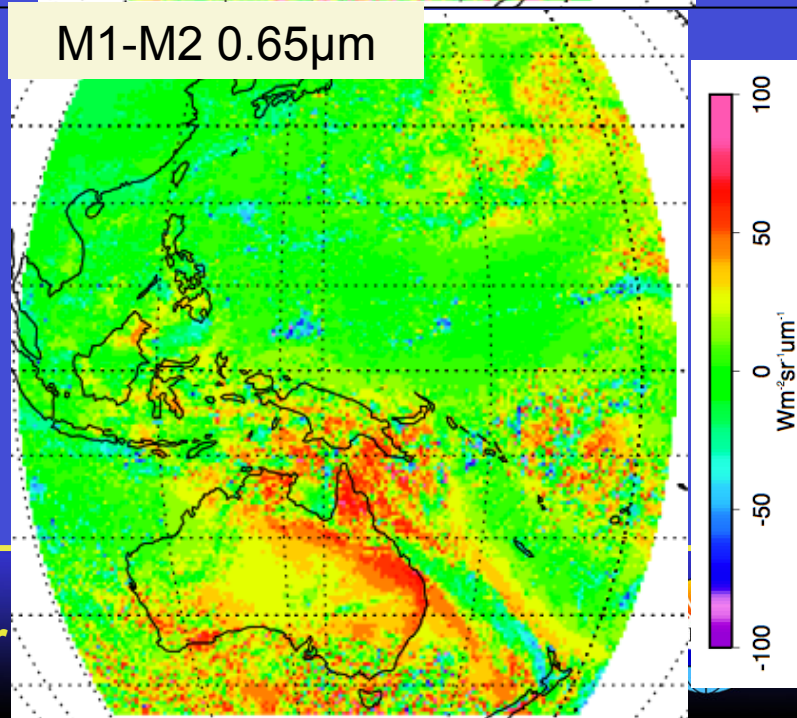
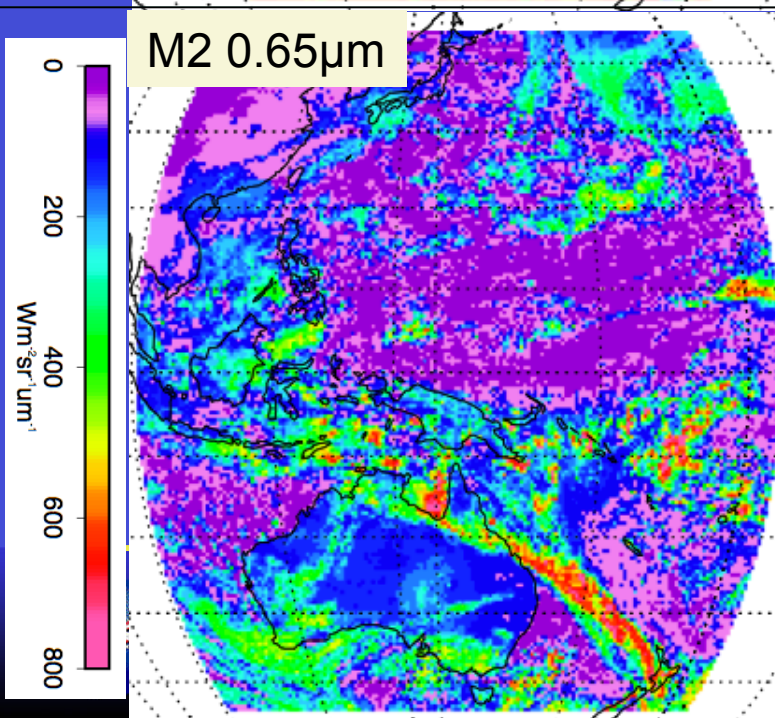
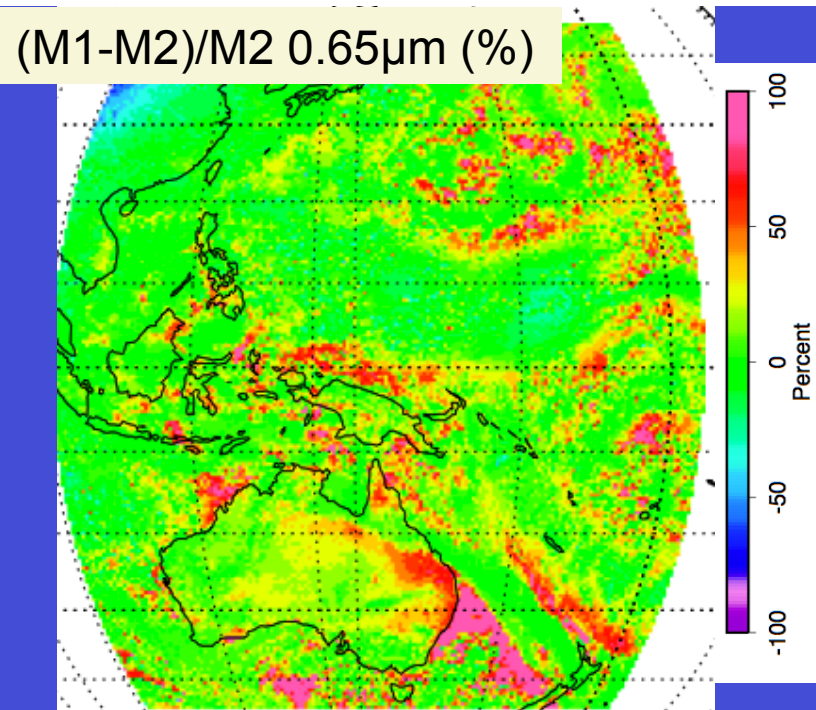
MTSAT1 – MTSAT2 comparison
2010 Dec 21 0:30Z



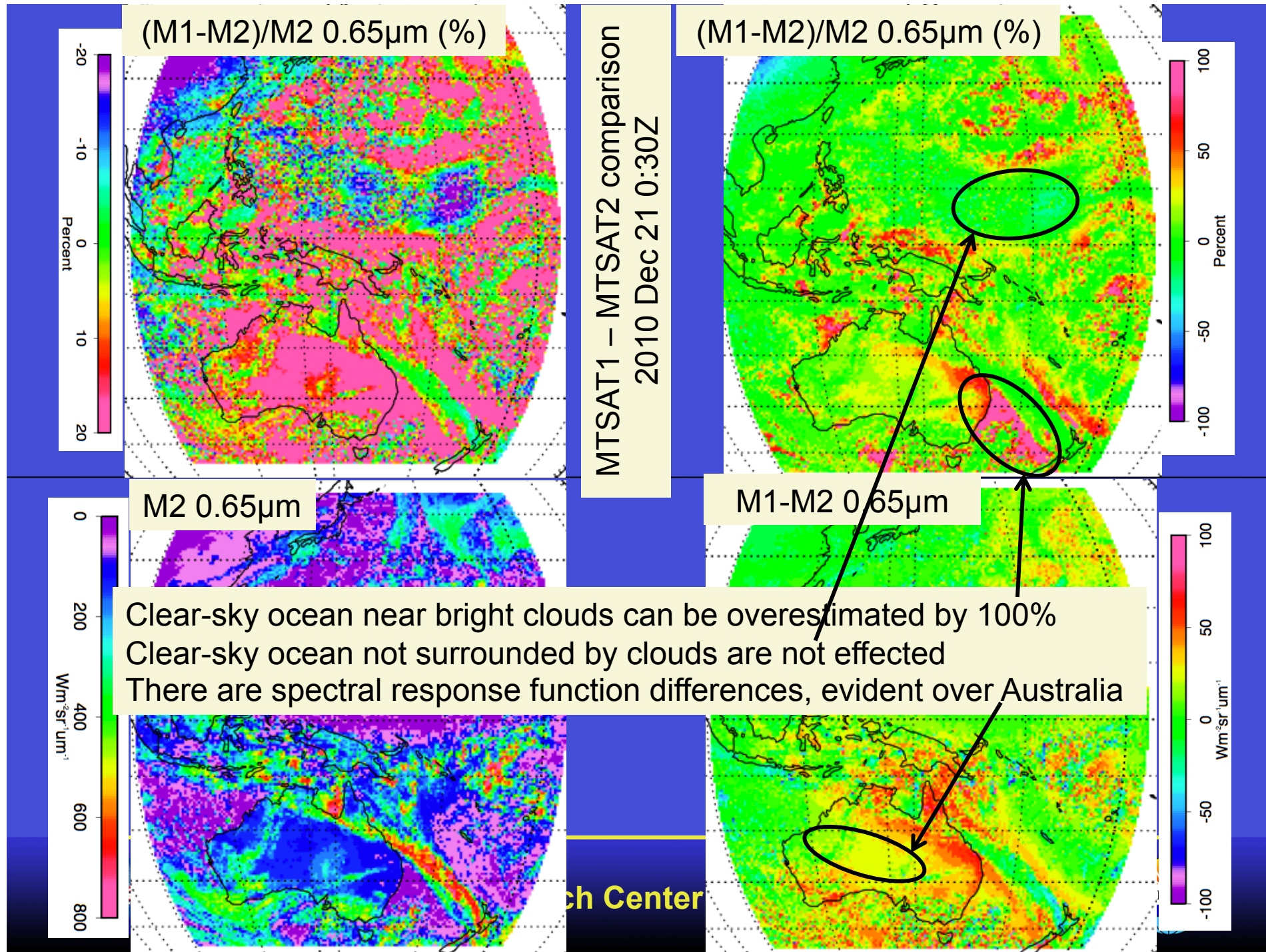
ch Center



MTSAT1 – MTSAT2 comparison
2010 Dec 21 0:30Z

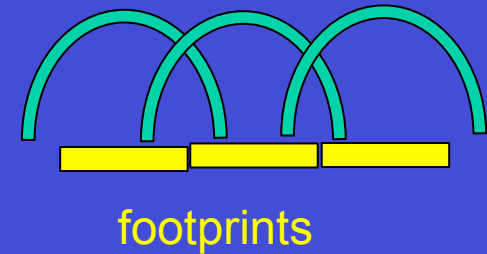
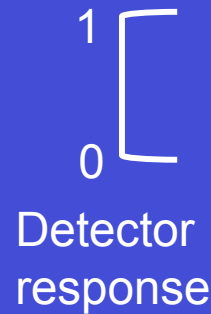
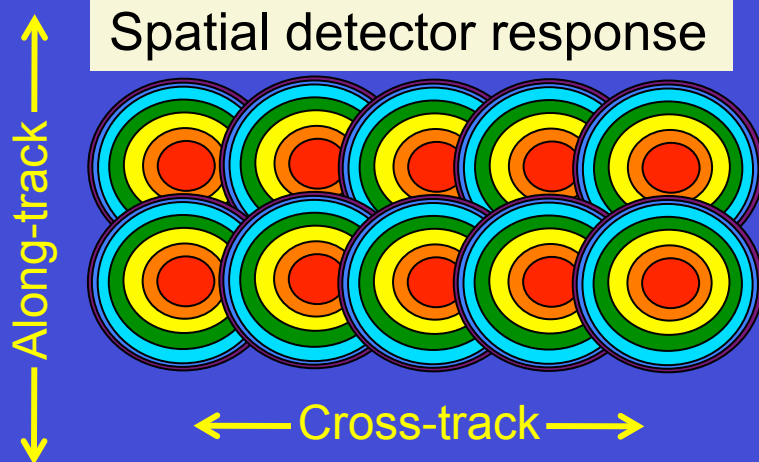


ch Center

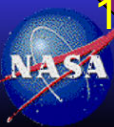
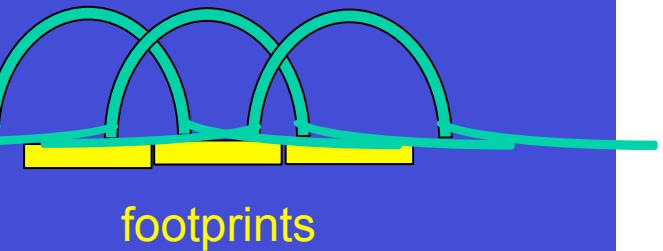
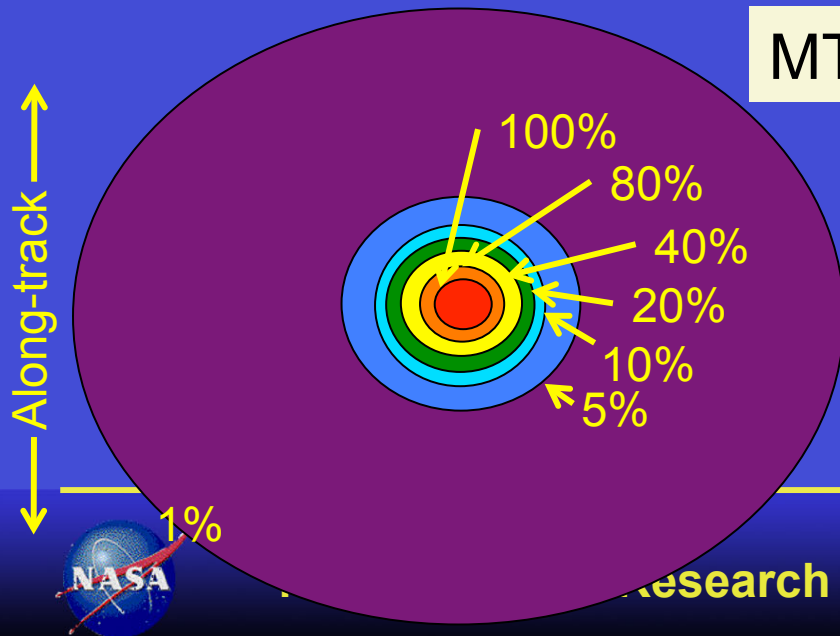


Detector point spread function??

MTSAT-2, push broom scanning



MTSAT-1, mirror scanning



CERES Prototype Ordering Tool

“Hi Norm, You are probably aware that everyone and their dog was downloading CERES data and playing around with it this week. I was unable to prevent myself from following suite”, September 11, 2011

User only needs 2 SYN product parameters but needs to order the entire product. “That's horrible! It's taking days for me to download all of the data from 2000 to 2005: each file is about 250 MB, so takes about 5 minutes to download. At this rate, it will take more than a week to download the data, if I can manage to do it without any interruptions.” August 5, 2011
Sub-setter to incorporate SYN/AVG/ZAVG next

D. Doelling
NASA LaRC

C. Chu, E. Heckert, E. Kizer, C. Mitrescu
SSAI

<http://ceres.larc.nasa.gov/index.php>

Google: CERES NASA


Atmospheric Sciences






Review order before submitting

[Home](#)
[Selection Page](#)
[? My Orders](#)
[Shopping Cart \(191.94 KB\)](#)


Parameter/spatial/temporal listing

 Remove All

	Selection Page		My Orders		Order Status
---	--------------------------------	---	---------------------------	---	------------------------------

Item	Product Info	Satellite	Temporal Range	Spatial Coverage	Order Status	Number Of Files	Completed Files	Processing Files	Failed Files	Order Size	Estimated Order Size
1	CERES_SYN1deg-lite_Ed2.5	TERRA	2000-03 to 2010-02	REGIONAL - Subset	processing	20	2	1	0	3.68 GB	37.6 GB
2	CERES_SYN1deg-lite_Ed2.5	TERRA	2000-03 to 2010-02	REGIONAL - Subset	waiting in queue	20	0	0	0	0.0 bytes	37.6 GB
3	CERES_SSF1deg-lite_Ed2.6	TERRA	2000-03 to 2010-12	GLOBAL	done	1	1	0	0	3.9 KB	3.82 KB
4	CERES_SSF1deg-lite_Ed2.6	TERRA	2000-03 to 2010-12	ZONAL	done	1	1	0	0	284.05 KB	283.06 KB
5	CERES_SSF1deg-lite_Ed2.6	TERRA	2000-03 to 2010-12	GLOBAL	done	1	1	0	0	3.9 KB	3.82 KB
										3.69 GB	75.2 GB

SSF level 2 subsetting goes public this week



CERES Home

Data Products

CMIP5 CERES Data

FAQ

Feedback

Site Map

CERES Data Products

To subset, visually browse, and download CERES data products in multiple file formats, click "Browse & Order". For more information on a specific product, click on the "Data Product" name. Or as a quick reference, click on the [i](#) icon.

Access to the complete CERES archived HDF data products, [HDF Products](#)

Level 4: Consistency between TOA global net flux and ocean heat storage.

Data Product	Description	Parameter	Resolution	Version/Availability	Order Data
EBAF	CERES TOA fluxes, energy balanced and clear-sky filled Data Quality Summary	i	i	i	Browse & Subset

Level 3: Spatial and temporally (daily, monthly, etc) averaged fluxes and cloud properties.

Data Product	Description	Parameter	Resolution	Version/Availability	Order Data
SYN1deg	CERES observed and GEO-enhanced temporally interpolated TOA fluxes, MODIS/GEO clouds and MODIS aerosols and associated computed flux profiles for consistent cloud properties Data Quality Summary	i	i	i	Browse & Subset
SSF1deg	CERES observed temporally interpolated TOA flux, MODIS clouds and aerosols Data Quality Summary	i	i	i	Browse & Subset

Level 2: CERES instantaneous footprint level fluxes and cloud properties.

Data Product	Description	Parameter	Resolution	Version/Availability	Order Data
SSF	Instantaneous footprint (20km nominal) CERES observed TOA flux, MODIS clouds and aerosols and parameterized surface fluxes. Data Quality Summary	i	FOV*	i	Subset (beta)

Only Edition3 SSF is available for subsetting, currently 2006-2010

SSF Level2 Product Availability*

Product	Sat	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Level3		Level3										
SSF Level2	Terra							Mar				Dec
	Aqua							Mar				Dec

* **Note:** The data available on the CERES Browse & Subset Ordering Tool is currently only a subset of complete time range of data as the latest Edition3A is still processing. The complete CERES archived hourly HDF data products beginning March 2000 may be ordered from [here](#).









Last updated Jul 2011



SSF level 2 beta ordering

- Combined effort of subsetting team and the ASDC
- 2006 to 2010, as Ed3 SSF is processed, in geographical database
- Order is taken from the order site, and specifics XML to the ASDC
- When ASDC finishes processing the data and is on the ftp site, user will get email
- We emphasize beta, large volume of files may kill the order, small orders requested

Parameters

<input type="checkbox"/> Time/Location/Angles 	Click to select individual parameters
<input type="checkbox"/> CERES Observed TOA Fluxes and Radiances 	Click to select individual parameters
<input type="checkbox"/> Surface Fluxes 	Click to select individual parameters
<input type="checkbox"/> Surface Parameters 	Click to select individual parameters
<input type="checkbox"/> GEOS-5 Atmosphere Parameters 	Click to select individual parameters
<input type="checkbox"/> Cloudy Footprint Area 	Click to select individual parameters
<input type="checkbox"/> MODIS Land Aerosols 	Click to select individual parameters
<input type="checkbox"/> MODIS Ocean Aerosols 	Click to select individual parameters

Spatial Resolution

☒ Regional

North
90
West 0 360 East
-90
South

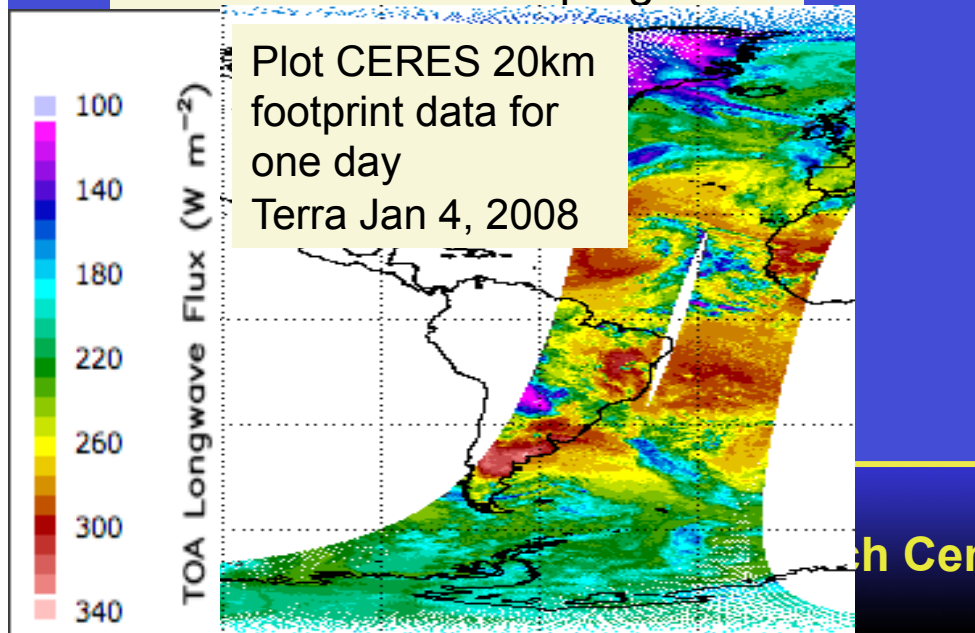


Map

SSF (level 2) example ordering

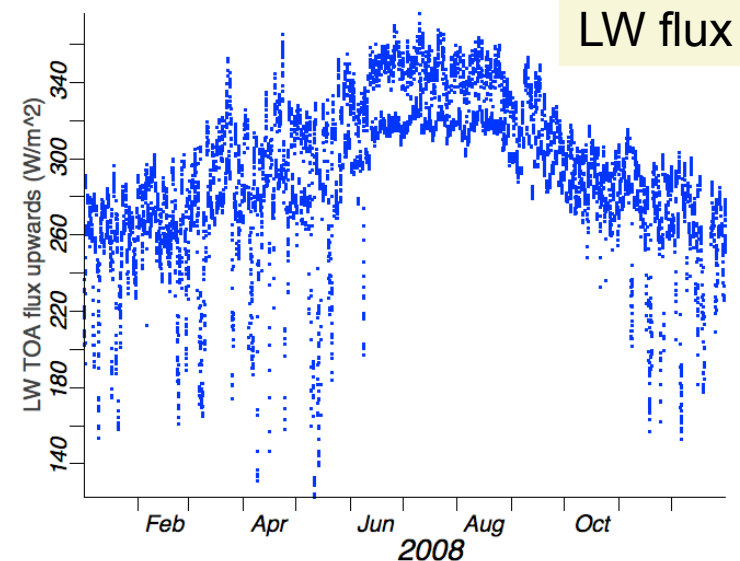
- Parameter Selection: SW,LW and WN flux
- Spatial Selection: Cairo lat and lon with a 30km radius
- Temporal Selection: all of 2008
- Result: One NetCDF file (0.4MB) of 730 footprints
- Time to order file: 25 minutes
- Traditional Way: ~0.5TB of 8760 HDF files (1250x more data)

Level 2 browse is in progress

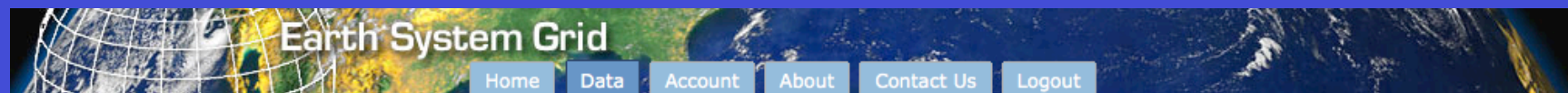


User plot from the data downloaded

CER_SSF_Terra-FM1-MODIS_Edition3A_2008_Cairo.nc



CERES EBAF Ed2.6 on ESG



Advanced Search

<http://pcmdi3.llnl.gov/esgcet/home.htm>

Search: for:

Search

Start Over

To conduct a search, select a category from the pull down menu and/or enter free text into the the text box.

Search Categories

Project

< Any Project
obs4MIPs

Institute

< Any Institute
NASA-LaRC

Model

> Obs-CERES-EBAF

Experiment

> obs

Frequency

> Monthly

Product

> observations

Realm

> Atmosphere

Variable

> toa incoming shortwave flux
> toa outgoing longwave flux
> toa outgoing longwave flux
assuming clear sky
> toa outgoing shortwave flux
> toa outgoing shortwave flux
assuming clear sky

Total Number of Results: 1

1-1 of 1 results

1. [obs4MIPs.NASA-LaRC.CERES-EBAF.atmos.mon](#)

☐ Data Center: ESG-PCMDI

Download Data

Sub Select File Results

File Name:

Use * for a wildcard character.
Regular Expressions will not work at this time.

Sub-Select

Variables:

- ☐ TOA Outgoing Longwave Radiation (rlut)
- ☐ TOA Outgoing Clear-Sky Longwave Radiation (rlutcs)
- ☐ TOA Incident Shortwave Radiation (rsdt)
- ☐ TOA Outgoing Shortwave Radiation (rsut)
- ☐ TOA Outgoing Clear-Sky Shortwave Radiation (rsutcs)

Files Download

*.nc

Download Files

Download all files for the selected datasets. Optionally use a wildcard expression to filter the filenames (example: use *.nc to

File Download Selection

[obs4MIPs.NASA-LaRC.CERES-EBAF.atmos.mon](#)
5 File(s)

Download ALL Selected File(s)

<input type="checkbox"/>	File	Size	Format	Location	Direct Download
<input type="checkbox"/>	rlut_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	NetCDF	DISK	download
<input type="checkbox"/>	rlutcs_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	NetCDF	DISK	download
<input type="checkbox"/>	rsdt_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	NetCDF	DISK	download
<input type="checkbox"/>	rsut_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	NetCDF	DISK	download
<input type="checkbox"/>	rsutcs_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	NetCDF	DISK	download

CERES EBAF Ed2.6 on ESG

Many thanks to Jerry Potter who let us use his CMOR checker on his machine so that the CF compliant and facilitating placing the data at the Goddard Gateway

Working with Luca Cinquini to put the tech-notes (DQS) in place, Here is an example AIRS dataset

Advanced Search

Search

To cc

Search Categories

Project

< Any Project
obs4MIPs

Institute

< Any Institute
NASA-LaRC

Model

> Obs-CERES-EBAF

Experiment

> obs

Frequency

> Monthly

Product

> observations

Realm

> Atmosphere

Variable

> toa incoming shortwave flux
> toa outgoing longwave flux
> toa outgoing longwave flux
 assuming clear sky
> toa outgoing shortwave flux
> toa outgoing shortwave flux
 assuming clear sky

☐ Data Center: ESG-PCMDI

Download Files

File Download Selection

obs4MIPs NASA-JPL AIRS L3 Monthly Data
6 File(s)

Download ALL Selected File(s)

<input type="checkbox"/>	File	Size	Format	Download	Tech Note
<input type="checkbox"/>	husNobs_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	
<input type="checkbox"/>	husStderr_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	
<input type="checkbox"/>	hus_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	Tech Note
<input type="checkbox"/>	taNobs_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	
<input type="checkbox"/>	taStderr_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	
<input type="checkbox"/>	ta_AIRS_L3_RetStd-v5_200209-201105.nc	441.26 MB	NetCDF	download	Tech Note

CERES ESG data on the CERES web page



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CERES Meetings

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CERES ESG Data Products

ESG Gateway hosted by the Program for Climate Model Diagnosis and Intercomparison

CERES provided these data files to the [ESG Gateway](#) hosted by the Program for Climate Model Diagnosis and Intercomparison (PCMDI) as part of an experimental activity to increase the usability of NASA satellite observational data for the model and model analysis communities. The PCMDI mission is to develop improved methods and tools for the diagnosis and intercomparison of general circulation models (GCMs) that simulate the global climate.

These are 5 variables from the CERES [EBAF](#) product.

- TOA Outgoing Longwave Radiation (rlut)
- TOA Outgoing Clear-Sky Longwave Radiation (rlutcs)
- TOA Incident Shortwave Radiation (rsdt)
- TOA Outgoing Shortwave Radiation (rsut)
- TOA Outgoing Clear-Sky Shortwave Radiation (rsutcs)

Variable	File	Size	Format	Technical Document	Data Download
rlut	rlut_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	netCDF	Documentation	Download Data
rlutcs	rlutcs_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	netCDF	Documentation	Download Data
rsdt	rsdt_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	netCDF	Documentation	Download Data
rsut	rsut_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	netCDF	Documentation	Download Data
rsutcs	rsutcs_CERES-EBAF_L4_Ed2-6_200003-201012.nc	32.16 MB	netCDF	Documentation	Download Data

To subset, visually browse, and download CERES data in netCDF format

[Browse & Order](#)

NASA Langley Research Center / Atmospheric Sciences



CERES EBAF Ed 1.0 data at NCAR

CGD ▾ CAS ▾ CAS research ▾ **Data Catalogs** ▾ Software ▾ publications ▾ for staff ▾



CGD's Climate Analysis Section

Search **advanced**

Clouds and the Earth's Radiant Energy System (CERES) Data

PLEASE NOTE: Any files downloaded prior to 2/27/2009 have a spurious clear-sky error. This has been corrected. Please download again!

The top of the atmosphere (TOA) monthly mean radiation fields for the Clouds and the Earth's Radiant Energy System (CERES) are made available here in netCDF. If you are a user of CERES data, please visit their web page at: <http://science.larc.nasa.gov/ceres/index.html>

Feel free to contact [John Fasullo](#) with any questions that you may have.

Products

- **Modified Monthly Means:** Clouds and the Earth's Radiation Energy System (CERES) Monthly Means from NASA Langley DAAC on Global - T63 (192 x 96) grid, for Mar 2000 - Oct 2005.
- **Long-Term Means (Climatologies)**
- **Mean Meridional Energy Transports:** Summary of the total, atmospheric and oceanic components.

[CERES FAQ's](#)

[Comments on Updated Data](#)

CAS Data Catalog Quick Links

[Catalog Home](#)

[Reanalysis Data](#)

[Satellite Data](#)

[Surface Data](#)

[Climate Indices](#)

[Ocean Data](#)

[An Informed Guide to Climate Data Sets](#)

To request data, please email: [CAS Data Manager](#)

Corresponding with Dennis Shea, who is updating with EBAF Ed 2.6
On Sept 14, he had a few suggestions regarding attributes

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<http://www.cgd.ucar.edu/cas/catalog/satellite/ceres/index.html>

CERES Giovanni

Aqua Edition2A SRBAVG

<http://disc.sci.gsfc.nasa.gov/giovanni>

+ ABOUT GIOVANNI + NEWS + INSTANCES + FEEDBACK + RELEASE NOTES + HELP

CERES and AIRS on Aqua

Clouds and the Earth's Radiant Energy System, Atmospheric Infrared Sounder

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CERES data are hosted and distributed by the NASA Langley Research Center Atmospheric Science Data Center ([ASDC](#)). Giovanni accesses CERES data from an [OPeNDAP](#) server also hosted by ASDC. This Giovanni instance contains CERES and AIRS on Aqua, Monthly, 1deg Grid data.
Please, read carefully [CERES Quality Summaries](#) from LaRC. Here, data are plotted as it is in the files. However, User-Applied Revisions from the Summaries must be applied when high accuracy is at issue.
[Link to calendar of CERES FM-3,FM-4 Operations.](#)

Select:

Spatial

Cursor Coordinates: 0.00000, 0.00000

Area of Interest: West: -180 North: 90 South: -90 East: 180 [Update Map](#)

Parameters

Display: ☒ Data Product Info ☐ Climatology Info ☐ Units ☐ Parameters with > 2 Dimensions ☐ Only Parameters with Climatology

Analysis Options: ☒ Parameter ☐ Climatology ☐ Anomaly [Show Notes...](#)

TOA Fluxes

☐ Clear-Sky(2002/07/01 - 2005/03/01)

Parameter	Data Product Info
<input type="checkbox"/> Clear-sky_TOA_Albedo	SRBAVG1_FM4.2A CERES 2002/07 - 2005/03
<input type="checkbox"/> Clear-sky_TOA_LW_Flux	SRBAVG1_FM4.2A CERES 2002/07 - 2005/03
<input type="checkbox"/> Clear-sky_TOA_Net_Flux	SRBAVG1_FM4.2A CERES 2002/07 - 2005/03
<input type="checkbox"/> Clear-sky_TOA_SW_Flux	SRBAVG1_FM4.2A CERES 2002/07 - 2005/03
<input type="checkbox"/> Total-Sky(2002/07/01 - 2005/03/01)	

Top-of-Atmosphere (TOA) fluxes

- [Clear-sky_TOA_Albedo](#)
- [Clear-sky_TOA_LW_Flux](#)
- [Clear-sky_TOA_Net_Flux](#)
- [Clear-sky_TOA_SW_Flux](#)
- [Total-sky_TOA_Albedo](#)
- [Total-sky_TOA_LW_Flux](#)
- [Total-sky_TOA_Net_Flux](#)
- [Total-sky_TOA_SW_Flux](#)

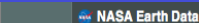
Surface Fluxes


- [Clear-sky_Sfc_Net_LW_Flux-Mod_B](#)
- [Clear-sky_Sfc_Net_SW_Flux-Mod_B](#)
- [Total-sky_Sfc_Net_LW_Flux-Mod_B](#)
- [Total-sky_Sfc_Net_SW_Flux-Mod_B](#)

Region Parameters

- [Precipitable_Water](#)

CERES at the ASDC

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CERES Data and Information

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS) program. The CERES instruments provide radiometric measurements of the Earth's atmosphere from three broadband channels. The CERES missions are a follow-on to the successful [Earth Radiation Budget Experiment \(ERBE\)](#) mission. The first CERES instrument (PFM) was launched on November 27, 1997 as part of the Tropical Rainfall Measuring Mission (TRMM). Two CERES instruments (FM1 and FM2) were launched into polar orbit on board the EOS flagship *Terra* on December 18, 1999, and two additional CERES instruments (FM3 and FM4) were launched on board EOS *Aqua* on May 4, 2002.

Ordering Data	Documentation	Tools and Images	Relevant Links
<ul style="list-style-type: none">ASDC Web Ordering ToolSubsetting InstructionsCERES Order Tool (Beta)Processing and Data Flow Diagram with temporal and spatial resolution information	<ul style="list-style-type: none">Data Products CatalogCollection GuidesFrequently Asked QuestionsData Quality Summaries from Data Set Tables:<ul style="list-style-type: none">CRS FSW SYN/AVG/ZAVGSSF SFC SRBAVG ISCCP-D2like EBAFES-4 ES-8 ES-9BDSCERES-MISR-MODIS (SSF-SSFMI)CERES-NEWSInstrument Operations	<ul style="list-style-type: none">Data Visualization Software (view_hdf)Information on HDFMATLAB Bug Fixes<ul style="list-style-type: none">AVG/ZAVG: 0-length VdataR2007b fixCERES Imagery and ArticlesExamples of Spatial Extent and Scan Modes	<ul style="list-style-type: none">Join CERES News ListCERES Main Home Page Aqua Terra TRMMCERES ARM Validation Experiment (CAVE)CERES/ARM Radiation Experiment (CARE)CERES Surface and Atmospheric Radiation Budget (SARB) PropertiesChesapeake Lighthouse and Aircraft Measurements for Satellites (CLAMS)CLAMS DataFast Longwave And Shortwave Radiative Fluxes (FLASHFlux)

http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html

Data Products: Includes Data Quality Summary, Description/Abstract, and Sample Software		
Data Products	Data Sets	Processing Level (details)
Clouds and Computed Flux Profile Data Sets Focus on Top-of-Atmosphere (TOA), within-atmosphere and surface fluxes from radiative transfer model calculations with inputs from several sources.	SYN/AVG/ZAVG: <ul style="list-style-type: none">Synoptic Radiative Fluxes and Clouds (SYN)Monthly Regional Radiative Fluxes and Clouds (AVG)Monthly Zonal and Global Radiative Fluxes and Clouds (ZAVG) AVG/ZAVG: 0-length Vdata MATLAB Bug Fix	Level 3
	Gridded Radiative Fluxes and Clouds (FSW)	Level 3
	Clouds and Radiative Swath (CRS) Subsetting Available	Level 2
	Energy Balanced and Filled (EBAF)	Level 4
Clouds and TOA/SFC Flux Data Sets Focus on TOA and surface radiation derived directly from CERES and imager measurements.	Monthly Cloud Averages (ISCCP-D2like)	Level 3
	Gridded TOA/Surface Averages (SRBAVG)	Level 3
	Gridded TOA/Surface Fluxes and Clouds (SFC)	Level 3

ASDC Java Order Tool

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Welcome guest

Keywords Search

Geographic Area

Data Set Info

Reset All

Login

Searching is done.

Project: (39)

Parameters: (384)

ACRIMII
AIRMISR
ARB
ARESE
ATOCAT

Appl

10METER SPECIFIC HUMIDITY
10METER TEMPERATURE
2METER MERIDIONAL WIND
2METER SPECIFIC HUMIDITY
2METER TEMPERATURE

Appl

Data Sets (634)
CER_SRBAVG_Terra-FM1-MODIS_Edition2D (210 files)

Geographic Area

Time Range

Name Matches (optional) e.g. MET20

North
90.00
West -180.00 180.00 East
00.00

Start 1900-01-01
YYYY-MM-DD
End 2025-12-31

Day/Night Flag
☒ Botl ☐ Day ☐ Nigh

Search Result (102 files)

File Name	Start Date	End Date	Size (bytes)
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200110	2001-10-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200207	2002-07-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200303	2003-03-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200304	2003-04-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200305	2003-05-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200306	2003-06-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200307	2003-07-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200308	2003-08-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200309	2003-09-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200310	2003-10-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200311	2003-11-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200312	2003-12-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200401	2004-01-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200402	2004-02-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200403	2004-03-01	00:00:00	
CER_SRBAVG1_Terra-FM1-MODIS_Edition2D_016028.200404	2004-04-01	00:00:00	

☐ All Files ☐ Compress ☒ Read Softwa ☐ MetaData Fil

File Info

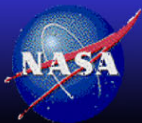
CERES Subset

FTP

Submit Order

CERES data ordering sites

- CERES web and tool (<http://ceres.larc.nasa.gov/>)
 - EBAF, SSFlite, SYNlite, ISCCP-D2like, SSF footprint
 - CMIP5 EBAF page
- ASDC (http://eosweb.larc.nasa.gov/PRODOCS/ceres/table_ceres.html)
 - All archived HDF products
- ESG gateway (<http://pcmdi3.llnl.gov/esgcet/home.htm>)
 - CMIP5 EBAF data
- NCAR site (<http://www.cgd.ucar.edu/cas/catalog/satellite/ceres/index.html>)
 - EBAF, currently being updated to Ed2.6
- GIOVANNI (<http://disc.sci.gsfc.nasa.gov/giovanni>)
 - Aqua Edition2A SRBAVG limited parameter product
- If anyone knows of any other sites, let me know



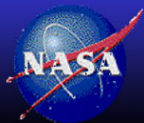
CERES order tool statistics

Users (EBAF/lite)	Email (ordered)	IP (visualize, order)
Unique Users	214(136)	316(272)

Product May10-Sep11	orders	files	Data Months (K)	Volume (GB) In HDF files
EBAF	326(138)	326(138)	24.7(10.5)	x (8.4)
SSFlite	402(229)	452(302)	32.0(18)	x (143)
SYNlite	471(227)	539(313)	26.2(16)	x (140)

() May 2010 to Apr 2011

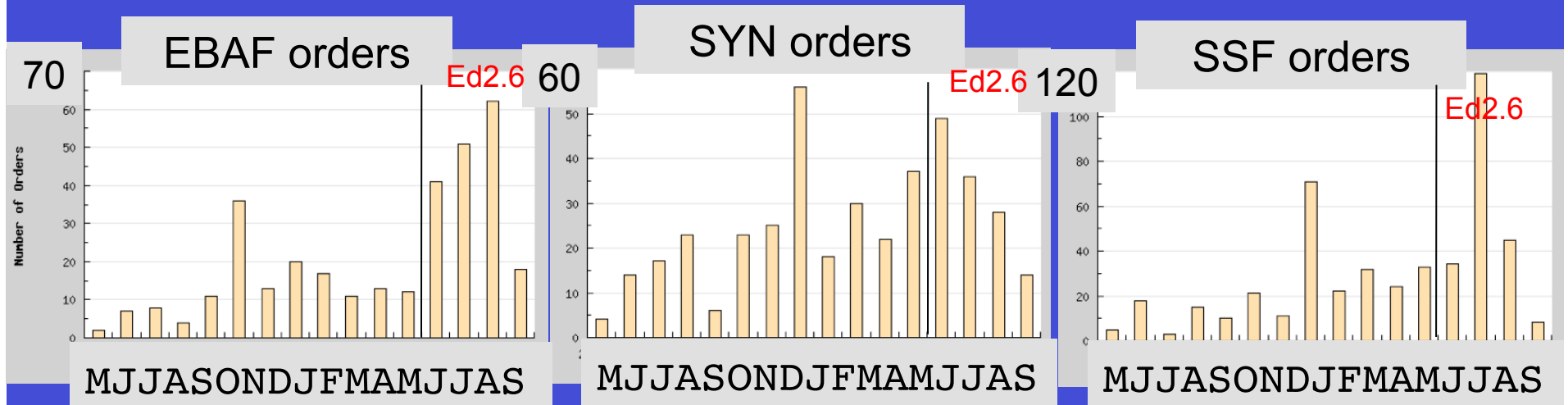
- The Edition2.6 has caused a lot of excitement
- At this rate we would double the number of orders compared with last year



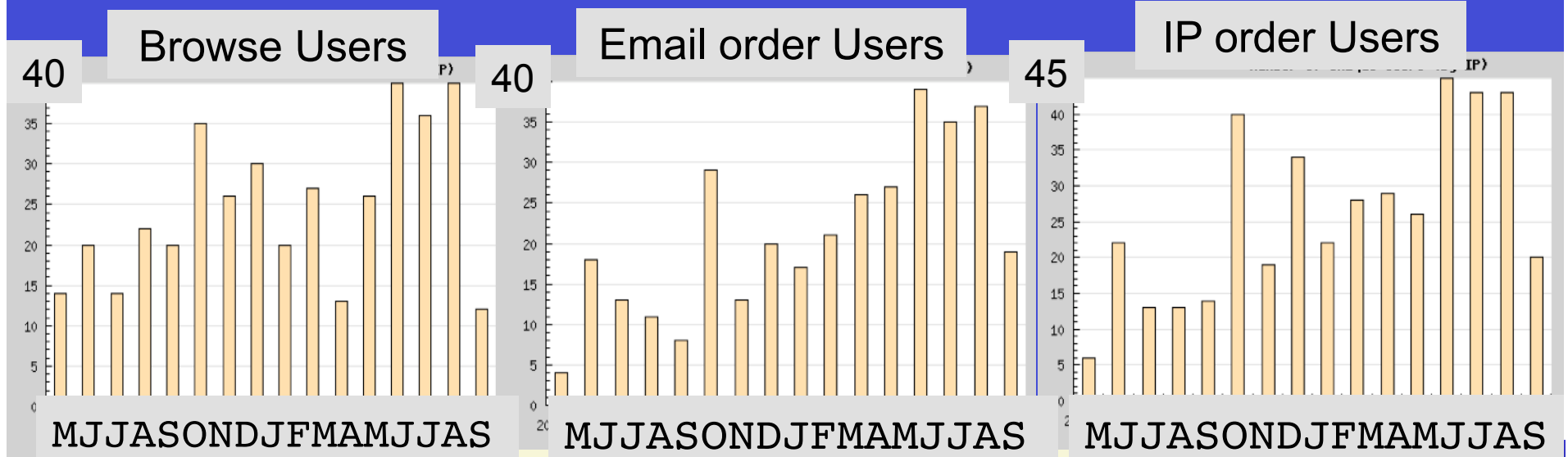
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CERES ordering tool stats



- Again users notice the new Edition 2.6



- <10% of users do not want to give out email when ordering
- Lately users browsing and ordering, previously more browsing than ordering

CERES Level 3 order statistics

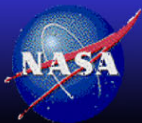
Ordering site	users	files	Months (K)	Volume (GB)
Order tool	226 328 IP address	892 351 EBAF	60 27.5 EBAF	300
ASDC	329	118K 36 EBAF	6.5	15TB
CMIP Aug 17-Sep15, 2011	11	51 EBAF only	7.2	1.6
ESG CMIP Aug-Sep15, 2011	10	44 EBAF only	6.2	1.4
Giovanni Sep2010-Jul2011	196	2092 Month files	2.1	0.3

- Users taking advantage of subsetting
- EBAF users ordering 10.3% of complete dataset
- SSFlite/SYNlite users ordering 0.4% of complete dataset
- “# of data months” is a more realistic ordering statistic



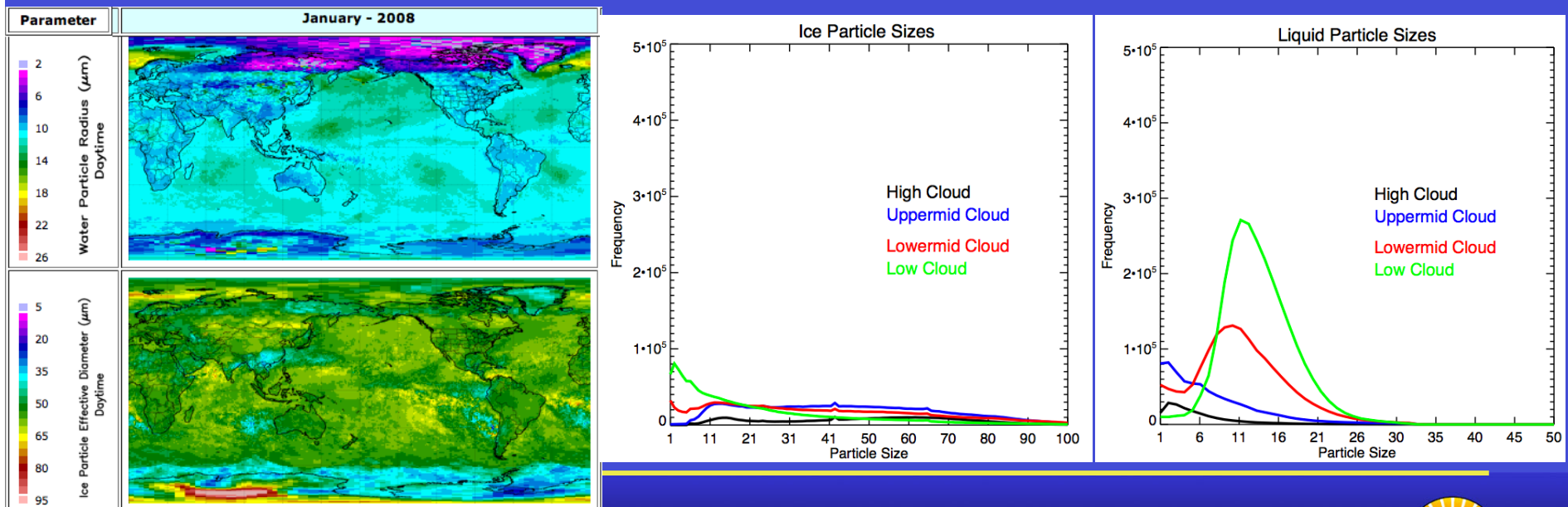
Ordering Tool Highlights

- Completed since last science team meeting
 - EBAF converted into CMIP CF compliant files and tested with CMOR checker and placed on the Goddard ESG gateway for PCMDI studies
 - CMIP files also place on the CERES order tool web site
 - Updated the SSFlite/SYNlite/EBAF Edition 2.6 files (noticed increased usage)
 - Implemented shopping cart feature
 - SSF level2 beta (operational this week)
- Future Goals
 - ISCCP-D2like test site fully functional (working out bugs in merge product)
 - SYN level3 (TSI/SYNI/SYN/AVG/ZAVG) 3-hour/daily/monthly, CERES/GEO TOA product, SARB computed product, being built on test web site, should be complete early next year



TSI delivery

- The TSI particle size were hardcoded to 10 μ m liquid radii and 60 μ m ice diameter
 - Coding bug fixed
- It was noted that many liquid radii < 4 μ m
- Code to be delivered this week to AMI-P

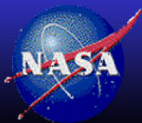
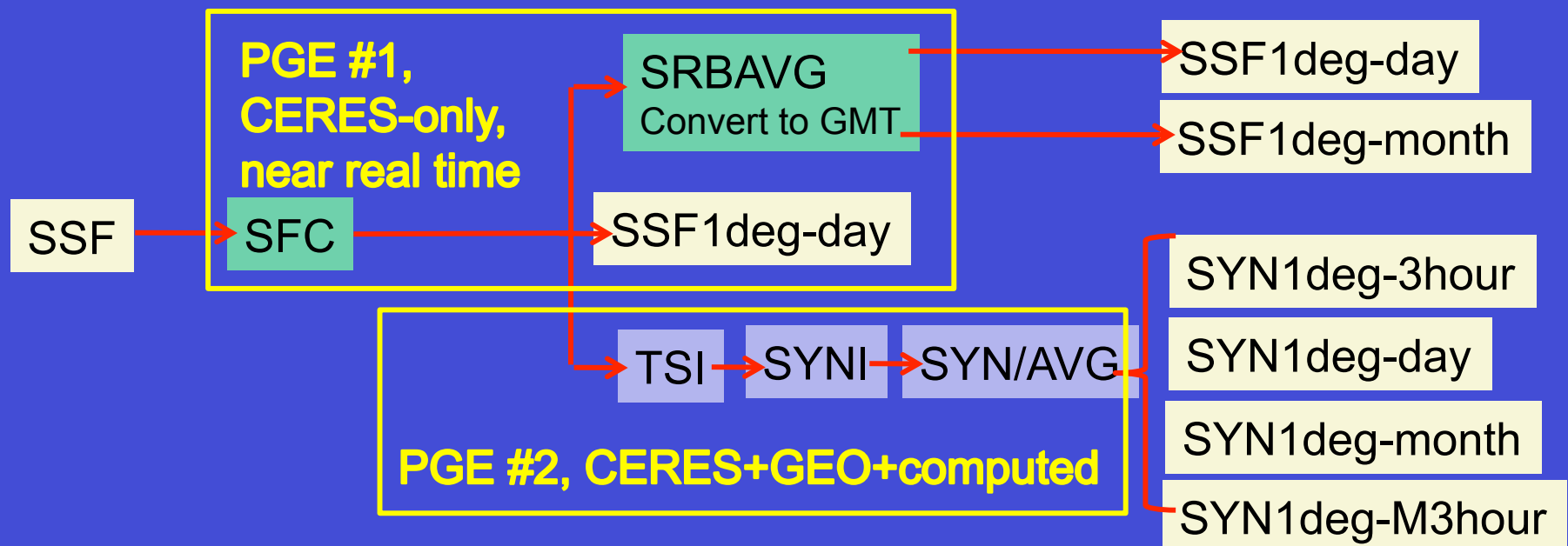


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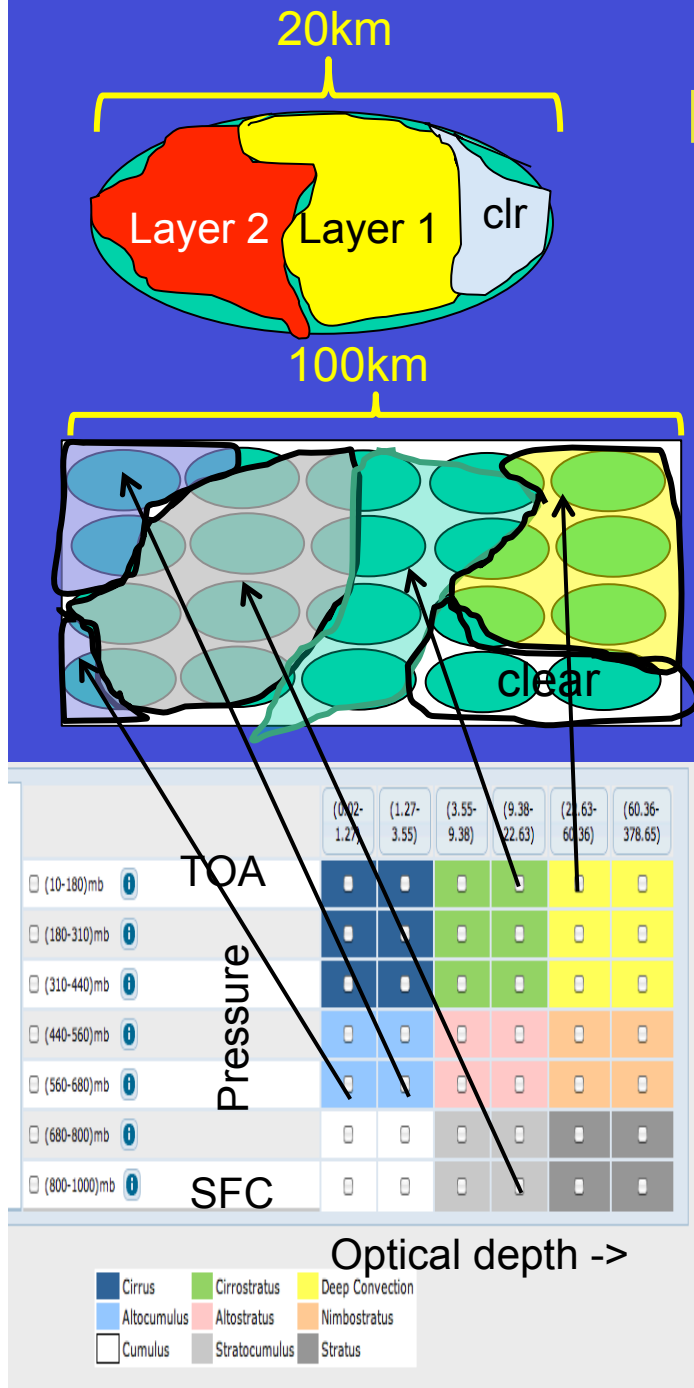


TISA Edition4 PGEs

- TISA will incorporate the subsetter to validate the entire dataset before delivery, 5 years of TSI ran in one hour
 - During TSI validation July 2010 bombed, takes too long to redeliver after every event
 - A chain of programs need to be validated as unit, an end to end test
 - Monthly means offer the most reliable validation

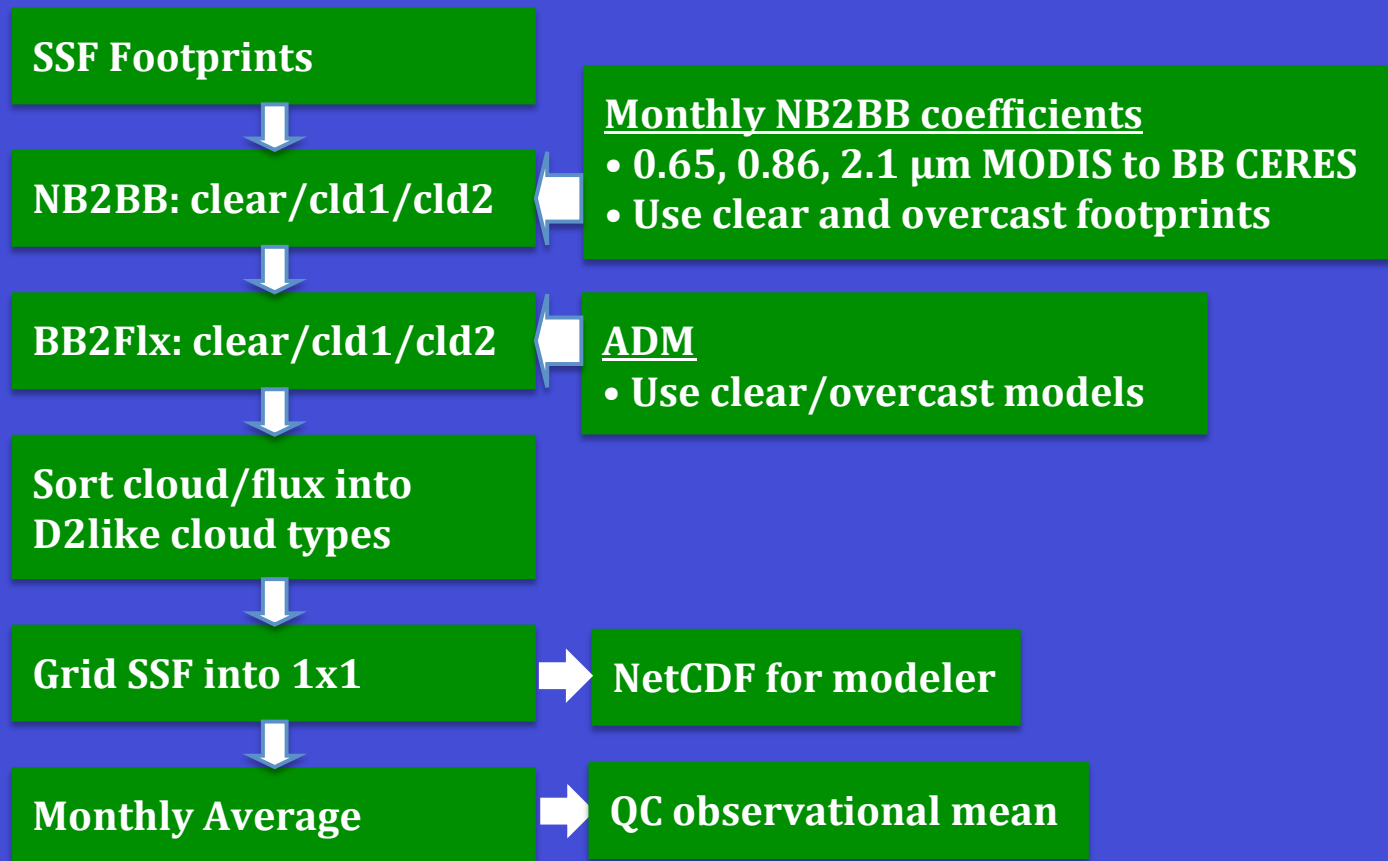


Flux-by-cldtype



- CERES measures 20km footprint fluxes
- Footprint is subdivided into clear and 1 or 2 cloud layers, based on MODIS 2-km pixel level retrievals
- Subdivided fluxes obtained from MODIS NB to CERES BB radiance monthly correlations and radiance to flux using CERES ADMs
- Instantaneous footprint subdivided fluxes are then binned into 1° by 1° regions according to ISCCP cloud types (6 optical depths, 7 pressure levels) and clear-sky
- Modelers may then compare computed individual cloud property fluxes with CERES during Aqua or Terra overpasses

Flux by cloud type Algorithm



Single scene:	total footprint flux
Clear & 1 layer:	layer1 = total – clearNBtoBB
Clear & 2 layers:	layer2 = total – clearNBtoBB – layer1NBtoBB



- Instantaneous gridded fluxes by cloud type
- Beta product being to be tested by Jason Cole

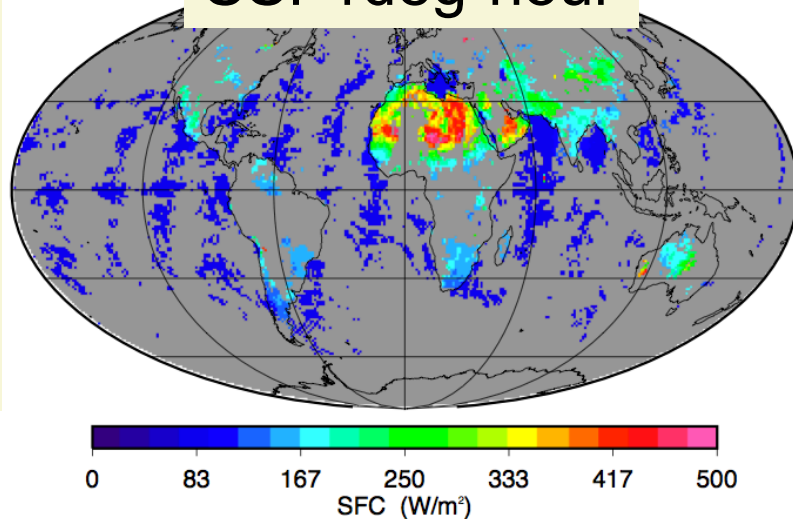
Earth Sciences



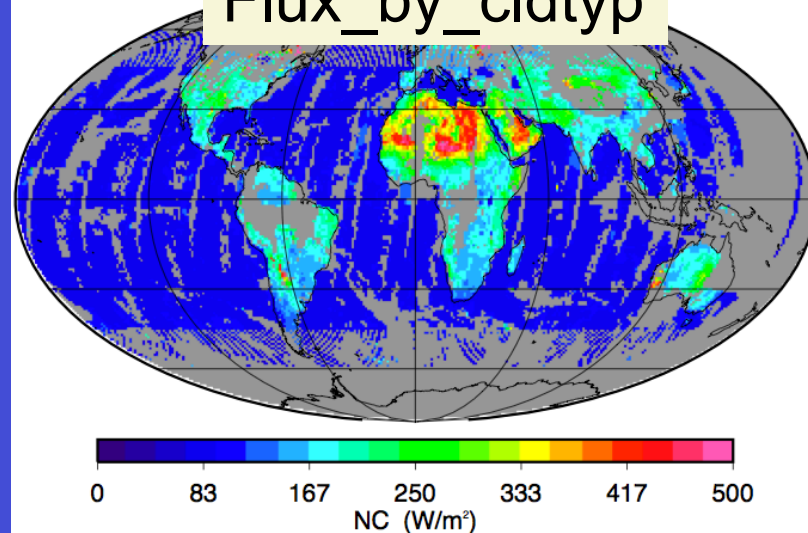
Flux_by_cldtyp, April 1, 2006, instantaneous 1° gridded

SW clear-sky

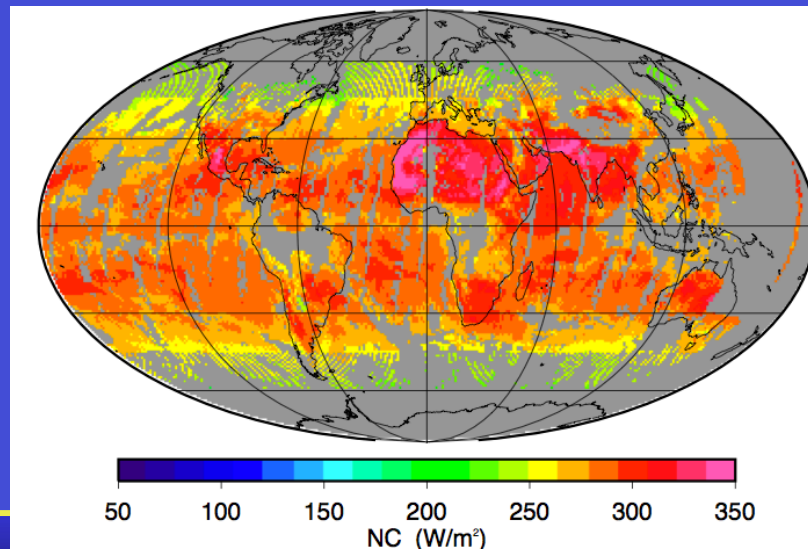
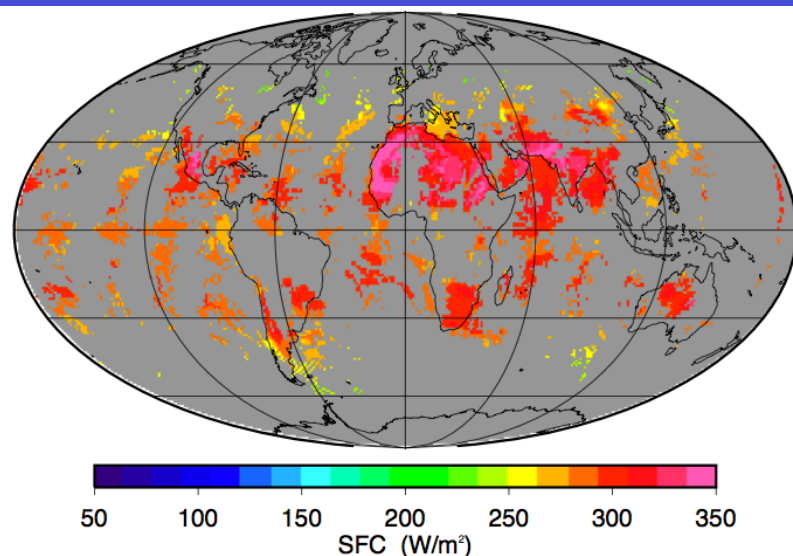
SSF1deg-hour



Flux_by_cldtyp



LW clear-sky



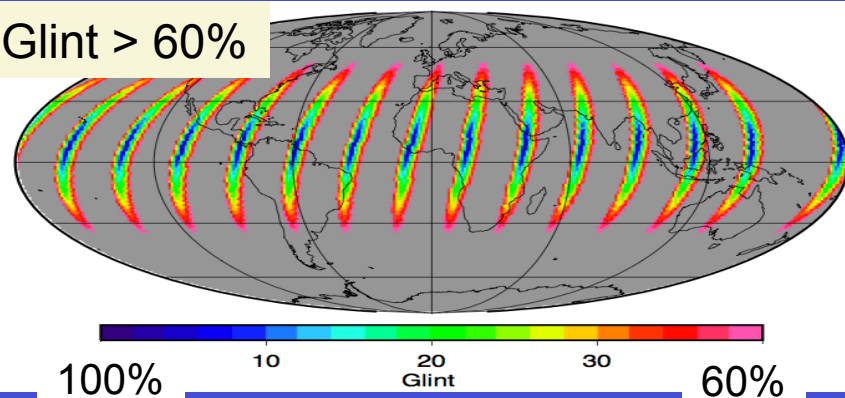
Observed footprint

NB/BB derived clear-sky

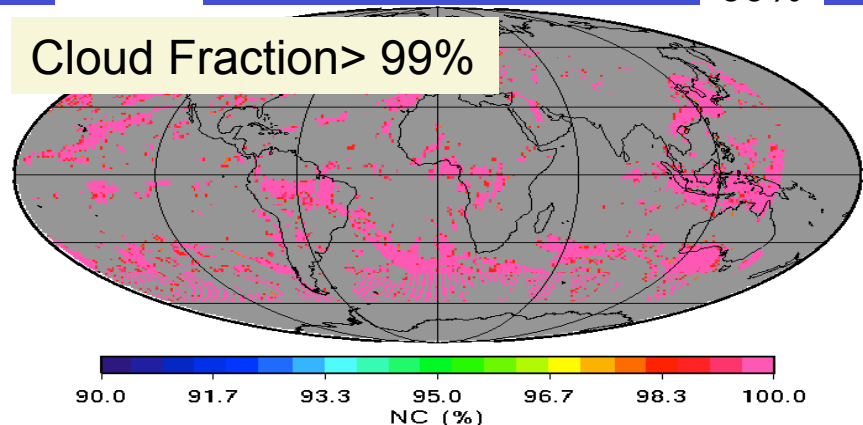
NB/BB not performed if

Snow/Ice fraction > 10%

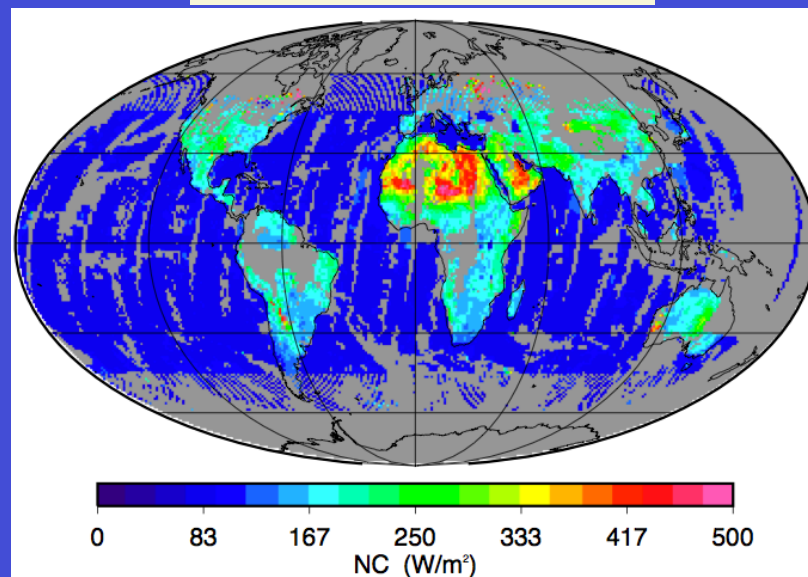
Glint > 60%



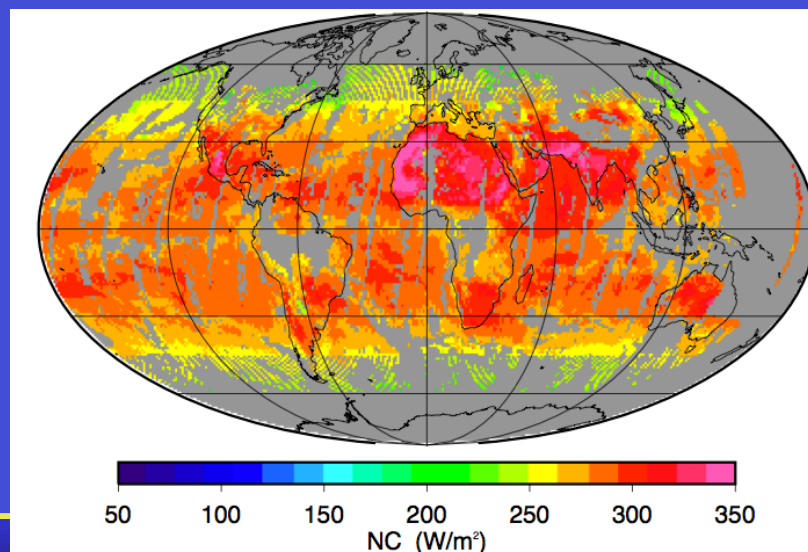
Cloud Fraction > 99%



Flux_by_cldtyp



SW clear-sky

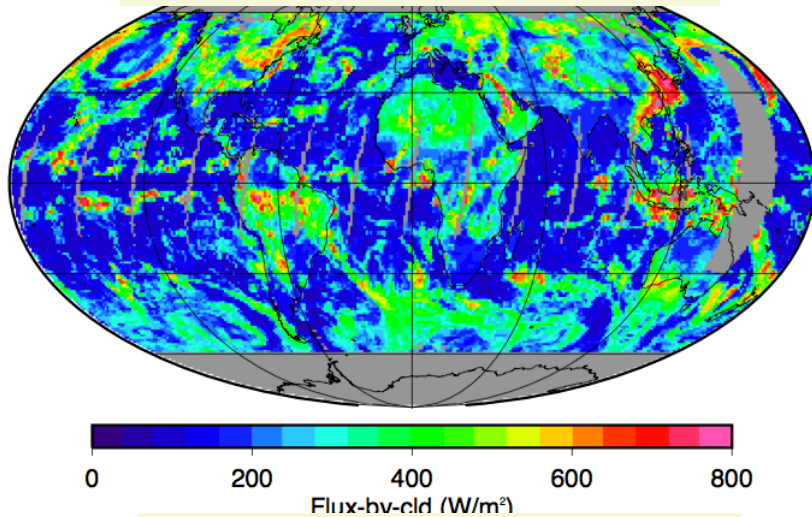


LW clear-sky

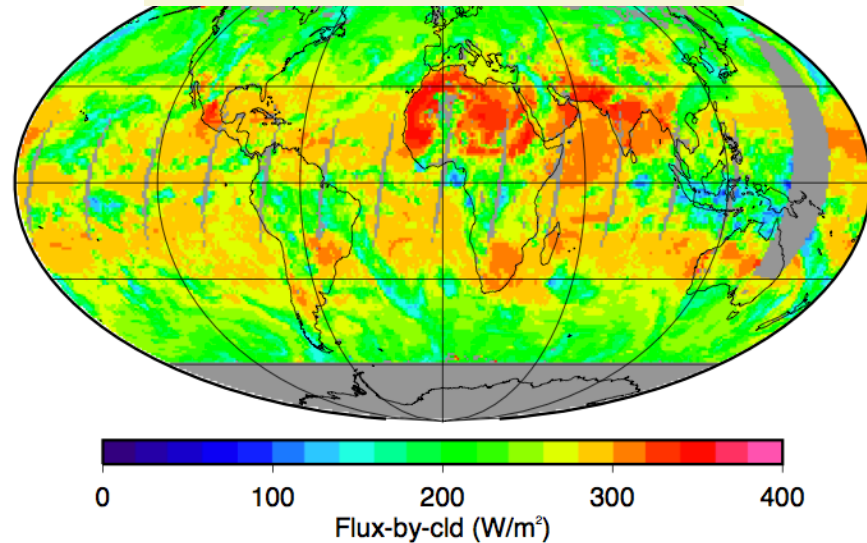
NB/BB derived clear-sky

All-sky Flux-by-cldtype Validation

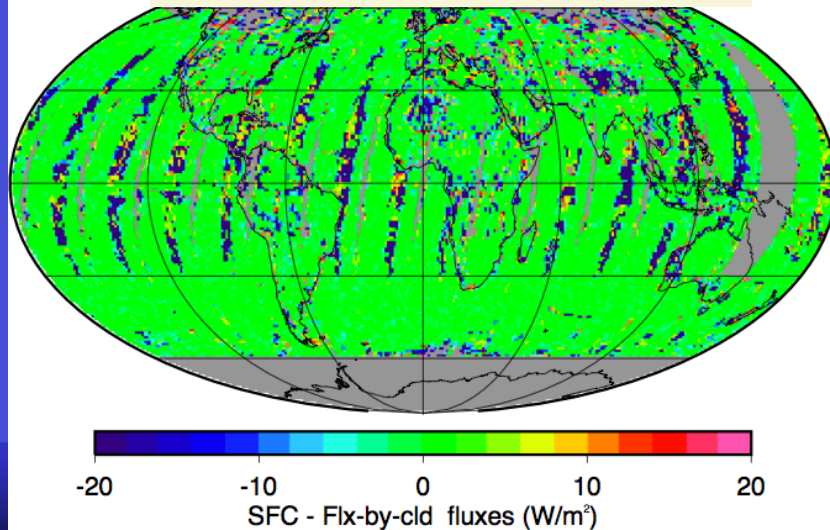
SW flux_by_cldtype



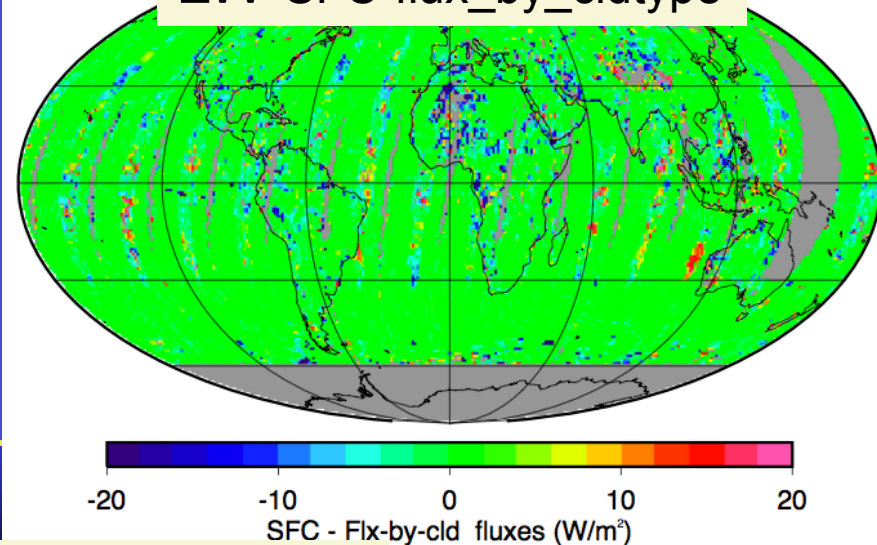
LW flux_by_cldtype



SW SFC-flux_by_cldtype



LW SFC-flux_by_cldtype



- NB/BB cannot accurately resolve glint and over snow

TISA Products/deliveries

- ISCCP-D2like
 - Day/Nit, GEO are Edition2
 - Terra/Aqua/GEO merge shortly to be delivered as Edition2
 - New MODIS/GEO cloud property normalization constraints to remove unrealistic cloud properties (out of range)
- TSI
 - Edition3 to be delivered this week
 - SYN/AVG/ZAVG already delivered
- Flux-by-cldtype
 - Validate by comparing to SFC cloud and fluxes
 - Clouds are being replicated, investigate a few minor regional flux differences
 - Let Beta testers use the product and make suggestions

